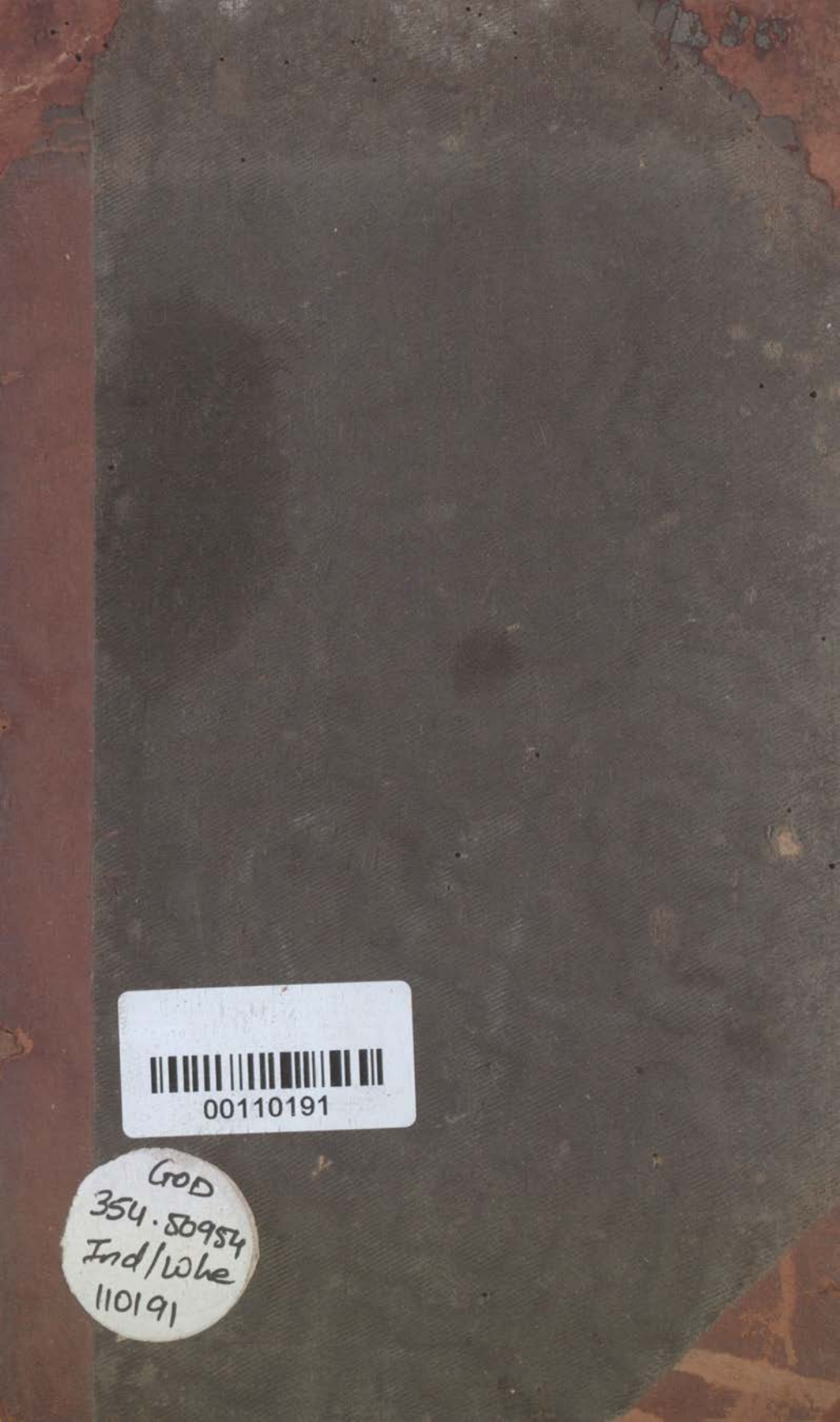
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THE

WHEAT PRODUCTION AND TRADE

OF

INDIA;

BEING A COLLECTION OF CORRESPONDENCE IN CONTINUATION OF THE PAPERS PUBLISHED AS "SELECTIONS FROM THE RECORDS OF THE GOVERNMENT OF INDIA (HOME, REVENUE AND AGRICULTURE DEPARTMENT), No. CLX OF 1879."

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CALCUTTA:
PRINTED BY THE SUPERINTENDENT OF GOVERNMENT PRINTING, INDIA.
1883.

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THE

WHEAT PRODUCTION AND TRADE

OF

INDIA.

No. 1, dated Fort William, the 7th January 1880.

From—The Government of India,

To—Her Majesty's Secretary of State for India.

No. 130, dated the 21st December 1876.
No. 14, dated the 18th January 1877.
No. 83, dated the 3rd July 1879.

REFERRING to Your Lordship's despatches noted in the margin, and in continuation of our letters No. 17, dated the 30th March 1877, and No. 14, dated the 22nd September last, we have the honour to forward a copy * of a volume of Selections containing Correspondence on the Subject of the Wheat Production and Trade of India.

* Twenty-nine additional copies sent by box packet.

2. For the information with which Your Lordship desired to be supplied in the despatches above mentioned, we would beg to refer to our Resolution dated the 30th October 1879, printed at the opening of the volume. This Resolution reviews the present state of wheat cultivation in India, and the measures which might be adopted for developing the export trade.

3. We should add, with reference to Your Lordship's despatch of the 3rd July last, that the Director of Agriculture and Commerce, North-Western Provinces and Oudh, and the Government of the Punjab have been asked respectively to supply the wheat required for milling experiments and the fresh samples required from the Punjab. Mr. Buck reports that he will send the wheat as soon as the present spring crops have been harvested. At present good grain is not easily procurable.

No. 1460, dated Naini Tál, the 24th August 1880.

From—ROBERT SMEATON, Esq., Junior Secretary to the Government of the North-Western Provinces and Oudh,

To—The Officiating Secretary to the Government of India.

WITH reference to your letter No. 296, dated the 16th June 1880, I am directed to submit, for the information of His Excellency the

Governor General in Council, a copy of the correspondence noted in the margin, giving particulars with cost of the samples of wheat sent to Her Majesty's Secretary of State; and to remark that, as unforeseen charges of this kind, though coming under Miscellaneous, were not provided for in the allotment made for these provinces, His Honour trusts that in future such charges will be met from Imperial funds.

From Director, Agriculture and Commerce, North-Western Provinces and Oudh, No. 414—A, dated the 8th August 1880.
G. O. No. 1458 of 1880, of this day's date.

2. I am further to observe that the expenditure incurred is considerable in view of the many pressing demands on provincial funds, and that probably it is larger than was anticipated when your letter directing the furnishing of these samples was written.

No. 414-A., dated Camp, Allahabad, the 8th August 1880.

From—F. N. Wright, Esq., Officiating Director, Department of Agriculture and Commerce, North-Western Provinces and Oudh,

To—The Secretary to the Government of the North-Western Provinces and Oudh.

With reference to the correspondence ending with this office No. 1592, dated the 20th July last, I have the honour to report that samples of the following varieties of wheat have been sent to the Government of Bombay for despatch to the Secretary of State :—

(1) Soft white wheat collected from Meerut and Muzaffarnagar, 365 maunds, including weight of bags, in 146 bags.

(2) Soft red wheat collected from Meerut, 363$\frac{3}{5}$ maunds, including weight of bags, in 144 bags.

(3) Hard red wheat collected from Banda, 356$\frac{9}{10}$ maunds, including weight of bags, in 138 bags.

2. In the Government of India Letter No. 296, dated the 18th September 1879, forwarded with North-Western Provinces Government Endorsement No. 2288, dated the 24th October 1879, I was directed to send to the Secretary of State 360 maunds of each of the following four varieties of wheat: soft white, soft red, hard white, hard red.

3. In compliance with the order, just as the harvest was gathered, responsible officials were sent to Meerut and Muzaffarnagar to purchase the soft varieties, and to the trans-Jumna country to purchase the hard varieties; samples were accordingly procured and sent to me for approval. It was, however, found that the hard white variety was not procurable in this province. It is grown to a very small extent in the country south of the Jumna, but is of such inferior quality and so much intermixed with other grains that I considered it not worth while to send any sample to England. From Dr. Forbes Watson's report it appears that the best hard white variety is grown in the Khandesh District of the Bombay Presidency. The Collector of that district has accordingly been requested to send 360 maunds of the same to the Secretary, Bombay Government, for despatch to England.

4. The purchase of the other three varieties was commenced at the beginning of May, and was not finished till the end of June. The delay was owing to the difficulty in procuring both the soft white and the hard red.

5. The soft white, which has been pronounced to be one of the best kind of wheat grown in the world, is cultivated by the industrious Jât peasantry of the Meerut and Muzaffarnagar Districts. Although the crop last year was above average, the grain was thinner owing to the prevalence of hot westerly winds which blew just as the crops were ripening. The sample sent is, therefore, not quite up to the mark. One of the chief defects of Indian wheat—the admixture of other grains—is not ordinarily found in this variety, for the Jâts usually cultivate it alone. There is, therefore, a great demand for it, and large quantities are annually sent to Bombay and to the Punjab. On that account, and in the expectation of higher prices later on, the cultivators were reluctant to part with their wheat just at harvest time to the official sent by this Department. The wheat was chiefly purchased at Malabri, a village in Muzaffarnagar, direct from the cultivators.

6. There was no difficulty in obtaining the soft red wheat, as any quantity of it can be had in the Meerut market. But this kind is only obtained intermixed with other grains with which it is sown, such as oil seeds, gram, peas, and safflower. It was, therefore, carefully cleaned of all admixture of foreign matter.

7. Much difficulty was experienced in procuring the sample of hard red wheat produced in the black soil in the Banda, Hamirpur, and other districts south of the Jumna. The country is wild, communications difficult, and the people as yet insufficiently appreciative of the blessings of trade. Large quantities of it are, however, taken towards the Central Provinces. The wheat was gradually collected from the villages, stored at the Kamasan tahsil of the Banda District, and brought to Allahabad by the Jumna, where it was sifted, and foreign grains and pieces of black earth with which it was much adulterated eliminated; similarly, the grain of the other two varieties was sifted and sorted before being despatched.

8. Great care was taken in despatching the wheat to Bombay to prevent the risk of its being damaged by rain. The grain has been securely packed in thick gunny bags and sent in water-tight carriages which the railway officials placed at the disposal of this Department and engaged should not be opened *en route*.

9. Arrangements were at first made to send the wheat through Mr. Harrison of Messrs. Stirling & Co. (who have since suspended payment), to whose care the wheat was sent to Bombay. But on receipt of the G. O. No. 1112, dated 1st July 1880, Mr. Harrison was directed to make over the wheat to some person appointed by the Bombay Government to take charge, and the Bombay Government were requested to appoint such a person. Intimation has been subsequently received that the Commissioner of Customs has been entrusted with the work of despatching the wheat to England.

10. The total expenditure incurred in purchasing and despatching the samples is as follows :—

Items.	Amount. Rs. A. P.	Total. Rs. A. P.
Soft white wheat—361 maunds, @ 18 seers per rupee	775 11 0	
Cleaning	30 5 6	
Price of 146 bags	45 4 0	
Cartage to railway station	26 4 0	
Railway freight from Muzaffarnagar to Bombay	483 9 0	
Weighing	9 14 3	
Miscellaneous : coolie hire, loading, sieving, &c.	15 12 2	
		1,386 11 11
Soft red wheat—360 maunds : 340 @ 19 seers, and 20 @ 18 seers per rupee	784 4 5	
Cleaning	60 9 6	
Bags	39 5 7	
Freight from Meerut to Bombay	464 14 0	
Weighing	10 9 1	
Coolie hire	6 1 6	
Miscellaneous	15 7 7	
		1,381 3 8
Hard red wheat—360 maunds, @ 20 seers per rupee	720 0 0	
Carriage from Kamason to river	18 0 0	
Carriage from villages to Kamason	4 0 0	
Boat-hire at Allahabad	50 0 0	
Bags	54 0 0	
Cleaning	91 15 6	
Weighing	11 0 0	
Cart-hire at Allahabad	9 10 0	
Coolie-hire at different places	28 8 1	
Miscellaneous	20 14 0	
Railway freight from Allahabad to Bombay	335 15 0	
		1,343 14 7
GRAND TOTAL		4,111 14 2

11. The total expenditure, therefore, amounts to Rs. 4,111-14-2, exclusive of the bill of Messrs. Stirling & Co., which has not yet been received in detail, but will probably, from information received, amount to some Rs. 300.

12. I have, therefore, the honour to request that the sum of Rs. 4,500 may be placed to my credit to meet the charges noted above, and I would point out that the total cost of this wheat should not be compared with the ordinary expenditure in despatching an equal weight of grain to England as a business transaction, but as the price paid for an experimental consignment specially selected and most carefully prepared for the special purpose to which Dr. Forbes Watson attaches so much importance.

13. I have taken every possible care that the experiment should not be vitiated by any defect in the quality of wheat specially ordered, and I request that a copy of this letter may be sent to the Secretary of State for India in order that he may clearly understand the circumstances of its collection and the resulting expenditure.

No. 1458, dated Naini Tal, the 24th August 1880.

From—R. SMEATON, Esq., Junior-Secretary to the Government of the N.-W. Provinces and Oudh,

To—The Accountant General of the North-Western Provinces and Oudh.

I AM directed to forward copy of a letter, No. 414-A., dated the 8th August 1880, from the Director of Agriculture and Commerce, North-Western Provinces and Oudh; and to request that you will adjust the charge incurred in the transmission of samples of wheat to Her Majesty's Secretary of State (amounting to Rs. 4,111-14-2) against provincial revenues.

No. 440A., dated Simla, the 22nd September 1880.

From—C. L. TUPPER, Esq., Offg. Under-Secretary to the Govt. of India,

To—The Secretary to the Government of Bombay.

No. F.414, dated the 8th August 1880.

I AM directed to forward copy of a letter from the Officiating Director of the Department of Agriculture and Commerce, North-Western Provinces and Oudh, and, with reference to paragraph 3 thereof, to request that, with the permission of His Excellency the Governor in Council, the necessary intimation may be given to the Secretary of State as soon as the sample of hard white wheat, which the Collector of Khandesh has been asked to forward, has been despatched.

No. 441, dated Simla, the 22nd September 1880.

From—C. L. TUPPER, Esq., Offg. Under-Secretary to the Govt. of India,

To—The Secy. to the Govt. of the North-Western Provinces and Oudh.

I AM directed to acknowledge the receipt of your letter No. 1458, dated the 24th ultimo, with an enclosure from the Director of Agriculture and Commerce, advising the despatch to the Secretary of State, in compliance with the request contained in my letter No. 296, dated the 18th September 1879, of samples of (1) soft white, (2) soft red, and (3) hard red wheat, and stating that the Collector of Khandesh has been asked to send the sample of the hard white variety which was not procurable in the North-Western Provinces.

2. In reply, I am to observe that the sorts of wheat required as mentioned in paragraph 16 of Dr. Forbes Watson's report, a copy of which was enclosed in my letter of 18th September last, were the following:—

(1) Fine hard white.
(2) Fine soft red.
(3) Fine soft white.
(4) Good average soft white, No. 2.

It is, moreover, stated at page 10, Appendix B, of Dr. Forbes Watson's Report, that the hard red variety is unsuitable for the European market. But, as it appears from Mr. Wright's letter that, instead of good average soft white, No. 2, hard red wheat has been sent, I am to enquire why

the latter variety has been sent instead of the kind specified in Dr. Forbes Watson's report.

No. 25, dated Simla, the 21st September 1880.

From—The Government of India,

To—Her Majesty's Secretary of State for India.

In paragraph 2 of Lord Cranbrook's despatch No. 83 (Statistics and Commerce), dated the 3rd July 1879, a request was made for the supply of certain samples of wheat for milling experiments. We have now the honour to forward copy of a letter * from the Officiating Director of the Department of Agriculture and Commerce, North-Western Provinces and Oudh, advising the despatch of the samples of wheat mentioned in the margin, and stating that the Collector of Khandesh has been asked to send the sample of the hard white variety which is not procurable in those provinces. We have asked the Government of Bombay to make the necessary intimation to Your Lordship as soon as this sample is sent.

* No. 414-A., dated the 8th August 1880.

(1) Soft white.
(2) Soft red.
(3) Hard red.

2. It will be noticed that, apparently by some mistake, a sample of hard red wheat has been forwarded instead of "good average soft white, No. 2," referred to in paragraph 16 of Dr. Forbes Watson's Report. We have asked the Local Government for an explanation on this point.

3. Your Lordship has already been advised of the transmission of the further samples of Punjab wheat, as directed by Lord Cranbrook.

No. 30 (Stat. & Com.), dated India Office, the 17th February 1881.

From—Her Majesty's Secretary of State for India,

To—The Government of India.

With reference to your letters noted in the margin, I forward herewith a copy of a report on the results of the examination of the 192 samples of wheat sent to this country, and 500 copies of the same paper will be forwarded to your address through the Store Department. This paper is intended to form a supplement to the Report by Dr. Forbes Watson which was enclosed in my despatch No. 83 of July 3rd, 1879. A copy of a letter from Mr. Alexander Smith, dated 29th October 1880, is also enclosed.

Home, Revenue and Agricultural Department (Agriculture and Horticulture)—
No. 17 of 13th July 1880.
No. 20 of 3rd August 1880.
No. 22 of 24th August 1880.

2. It would be interesting if a report could be furnished by your Government giving some description of the nature of the soils in which the better classes of wheats indicated in these reports are grown, as well as of the system of cultivation followed. Thus, it would be desirable to know whether the best wheats are raised on irrigated or on manured land, also whether the land has been long cultivated with wheat crops, and what is the average weight of crop per acre.

3. It has been alleged that the productive power of the soil in some parts of India has begun to fail, and it should be ascertained whether there is any evidence of this in respect to the quality and quantity of the wheat crops raised.

Supplemental Report on Indian Wheat.

THE Report on Indian wheat by Dr. Forbes Watson in 1879 made definite allusion to the "weevilled" condition of the samples received for valuation from the Punjab and Sind. In consequence of this a second series of samples were forwarded from the Punjab during 1880 for supplementary valuation and report. It is with special reference to these samples that the following observations are submitted.

The samples, as enumerated below, were sent from the following localities:—

District.	No. of Samples.	District.	No. of Samples.
Delhi	7	Jhelum	2
Gurgaon	1	Gujrat	3
Karnal	5	Shahpur	8
Hissar	2	Mooltan	3
Rohtak	13	Kohat	5
Sirsa	3	Rawulpindi	13
Amballa	2	Muzaffargarh	6
Ludhiana	2	Jhang	11
Simla	4	Bannu	1
Jullundur	3	Peshawar	4
Hoshiarpur	4	Hazara	4
Kangra	3	Montgomery	11
Amritsur	3	Dera Ghazi Khan	14
Gurdaspur	6	Dera Ismail Khan	19
Sialkot	11		
Lahore	11	TOTAL	192
Ferozepore	4		
Gujranwala	4		

Although some of these samples were weevilled, they were not destroyed to such an extent as to prevent their approximate valuation, and the majority were in excellent condition.

The valuation was undertaken by the same expert as on the previous occasion, which has ensured the necessary uniformity essential for comparison. The advanced prices ruling in the English market at the time of this last valuation (11th October 1880) must, however, be taken into account in comparing the two valuations. The prices ruling at the time of the first valuation are given in the report. The prices ruling at the time of this second valuation are as follows:—

Mark Lane Corn Exchange, 11th October 1880.

English red	per imp. qr.	39*s.* to 43*s.*
„ white	„	42*s.* to 47*s.*
Dantzig	per 496 lbs.	—
Rostock and Pomeranian	„	46*s.* to 51*s.*
Petersburg	„	None.
Saxonka	„	48*s.* to 50*s.*
Nicolaieff and Odessa Ghirka	„	42*s.* to 46*s.*

Berdiaski and Marianople	per 496 lbs.	None.
Danubian	„	None.
Taganrog Ghirka	„	44*s.* to 46*s.*
„ hard	„	48*s.* to 50*s.*
Australian	„	50*s.* to 51*s.*
New Zealand	„	44*s.* to 54*s.*
Californian and Oregon	„	None.
White American and Canadian	„	46*s.* to 47*s.*
No. 1 Milwaukee	„	48*s.* to 49*s.*
No. 2 do.	„	46*s.* to 47*s.*
No. 2 spring	„	45*s* to 46*s.*
Red winter, new	„	47*s.* to 48*s.*
„ old	„	50*s.* to 52*s.*
Calcutta, No. 1, white	„	48*s.* to 49*s.*
„ No. 2 „	„	46*s.* to 47*s.*
„ ordinary	„	44*s.* to 45*s.*
„ red	„	42*s.* to 43*s.*
„ hard	„	44*s.* to 45*s.*
Bombay, red and white	„	46*s.* to 50*s.*
Kurrachee	„	44*s.* to 46*s.*

By comparison of the prices at the two periods a considerable advance will be noticed in 1880. In reference to this, the valuer has stated, in reply to a request for a statement of the relationship which the prices at one period bore to the other, that "we may take the average rise in value of wheat on the 11th October 1880, as compared with 14th March 1879, to be, say, 4*s.* 6*d.* per quarter of 480 lbs. On some kinds, such as Russian Ghirkas, the increase in value is, from special causes, much more, say about 8*s.* per quarter of 480 lbs.; but, taking the market value as a whole, the increase is as above stated."

In consequence of this condition of the markets it has been thought to be advisable to present the valuation as it has been made, with its relation to the prices ruling in October 1880, since any attempt by means of a diminution to the extent of 4*s.* 6*d.* per quarter all round would be inadequate, for the 8*s.* advance in Ghirka would represent also a greater advance than 4*s.* 6*d.* in all the class of Indian hard reds, some of which greatly resemble Ghirka. This will, to a great extent, explain the apparently great anomaly of hard red wheat bearing so low a price in the former valuation, and so high a one in the present.

The whole collection of 192 samples may be found classed in the following table:—

Denomination.	Value.			Total.
	48*s.* 6*d.* and above	46*s.* 6*d.* to 48*s.*	46*s.* and under.	
A.—Soft white	17	14	...	31
B.—Hard white	17	40	10	67
C.—Soft red	3	22	6	31
D.—Hard red	1	36	22	59
Mixed	...	...	...	4
TOTAL	38	112	38	192

By computing the whole of the 192 samples at the rates quoted, always taking the lowest value where a range of 6*d.* or 1*s.* is allowed, the result

is a very satisfactory one, as it gives an average value per quarter of 46*s.* 10½*d.* against 39*s.* 8*d.* for the whole of India in the previous valuation, or an advance of 7*s.* 2½*d.*, which cannot be all attributed to advanced prices.

Only seven samples were valued at or below 41*s.* 6*d.*, which is scarcely 4 per cent., whereas in the previous valuation fully 14 per cent. of the total of samples valued were below 37*s.* per quarter. In the present instance, with but one exception, all the inferior samples (with a value under 41*s.* 6*d.*) were sent from Dera Ghazi Khan and Dera Ismail Khan, the low price being occasioned by the dirtiness of the samples, which includes under the term "dirty" an admixture of barley or other grain.

A.—Soft white wheat.

The samples which fall under this heading do not extend over such a wide range of value as did those of the previous valuation. They are arranged in order of prices in the following table; the approximate value at the period of the last valuation in February 1879 would have been about 4*s.* 6*d.* per quarter less.

Numbers in Valuation List.	Locality.	Weight per Bushel.	Price per Quarter.	Remarks.
		lbs.		
117	Muzaffargarh	63	50*s.* 6*d.* to 51*s.*	Very finest, like Oregon.
110	Rawalpindi	62½	50*s.* 6*d.*	Very fine, like Australian.
19	Rohtak	64	50*s.*	Like Australian.
67	Lahore	62½	,,	Ditto.
69	Ditto	62½	49*s.* 6*d.*	Ditto.
156	Rohtak	62½	49*s.* to 49*s.* 6*d.*	Extra No. 1.
158	Ditto	62	,,	
159	Dera Ghazi Khan	62	,,	
15	Hissar	62½	49*s.*	Like Australian.
43	Amritsur	64	,,	Ditto.
137	Hazara	59	,,	The low weight caused by weevils; price, if free from insects, like Spanish.
138	Ditto	60	,,	Ditto.
75	Ferozepore	63	48*s.* 6*d.* to 49*s.*	Like Chilian.
98	Kohat	61½	48*s.* 6*d.* to 49*s.*	
157	Rohtak	62½	,,	
132	Peshawur	63½	48*s.* 6*d.*	
165	Dera Ghazi Khan	60½	,,	Extra No. 1.
3	Delhi	64	48*s.*	Like Chilian.
12	Karnal	62½	,,	Like Australian.
13	Ditto	61½	,,	Ditto.
22	Sirsa	62	,,	
23	Amballa	63	,,	Like Kubanka.
66	Lahore	63	,,	Small round.
145	Montgomery	61	,,	
4	Delhi	62½	47*s.* 6*d.* to 48*s.*	Like Chilian.
26	Ludhiana	58½	47*s.* 6*d.*	
47	Gurdaspur	61½	,,	Like Chilian.
6	Delhi	63	47*s.* to 47*s.* 6*d.*	Like Californian.
61	Lahore	61½	46*s.* 6*d.*	Small round.
74	Ferozepore	62½	,,	
78	Gujranwala	61	,,	

These 31 samples have, therefore, only an extreme range of 4*s.* to 4*s.* 6*d.* per quarter, the highest being from 50*s.* 6*d.* to 51*s.*, and the lowest 46*s.* 6*d.* Making allowance for the difference in market value at the two periods, these would all fall within the two highest groups of the classification adopted in Dr. Forbes Watson's Report, 25 of them being of the quality denominated "superior," and 6 of "No. 1 Club." The one sample, No. 117, valued at from 50*s.* 6*d.* to 51*s.*, with a weight of 65 lbs. per bushel, would not be equal to the Delhi sample No. 273 of the Report then valued at 48*s.*, which at the date of the present valuation would have advanced to about 52*s.* 6*d.* Although some of the samples were "weevilled" more or less, the valuation has been based on the value of the grain in a sound state.

B.—Hard white wheat.

In the previous valuation only three samples of hard white wheat were valued from the Punjab, whereas there are no less than 67 in the present series. By arranging the whole of these in gradation according to price, it will be observed that they compare favourably with the samples previously reported on from the whole of India—

Numbers in Valuation List.	Locality.	Weight per Bushel.	Price per Quarter.	Remarks.
		lbs.		
128	Jhang	64	49*s.* 6*d.* to 50*s.*	Like pearl barley.
113	Muzaffargarh	64	49*s.* 6*d.*	Ditto.
109	Rawalpindi	61½	49*s.*	
139	Montgomery	61½	,,	Mixed.
161	Dera Ghazi Khan	61½	,,	
32	Jullunder	63	48*s.* 6*d.* to 49*s.*	Like Kubanka.
33	Ditto	63	,,	Ditto.
173	Mooltan	64	,,	Like pearl barley.
172	Dera Ghazi Khan	63	48*s.* 6*d.* to 49*s.*	Ditto.
10	Karnal	63½	48*s.* 6*d.*	Like No. 1 Kubanka.
14	Hissar	59½	,,	Weevilled.
50	Sialkot	61	,,	Like Kubanka.
52	Ditto	62½	,,	Ditto.
58	Ditto	60½	,,	Ditto.
59	Ditto	62	,,	Ditto.
160	Dera Ghazi Khan	60½	,,	
166	Ditto	59½	,,	
2	Delhi	64¼	48*s.* to 48*s.* 6*d.*	Like Australian.
94	Mooltan	62	,,	
111	Rawalpindi	60½	,,	
147	Montgomery	62	,,	
168	Dera Ghazi Khan	63½	,,	Like pearl barley
37	Hoshiarpur	63½	48*s.*	
39	Kangra	62	,,	
46	Gurdaspur	63½	,,	Like Kubanka.
48	Ditto	60½	,,	Ditto.
56	Sialkot	61	,,	Ditto.
57	Ditto	60½	,,	Ditto.
68	Lahore	62	,,	
112	Rawalpindi	61	,,	
118	Muzaffargarh	62	,,	
127	Jhang	61½	,,	

Numbers in Valuation List.	Locality.	Weight per Bushel.	Price per Quarter.	Remarks.
		lbs.		
129	Jhang . . .	61	84*s.*	Like Kubanka.
176	Dera Ismail Khan .	60½	,,	
178	Ditto . . .	59½	,,	
183	Ditto . . .	60½	,,	
29	Simla . . .	64½	47*s.* 6*d.* to 48*s.*	
30	Ditto . . .	62	,,	Ricey.
60	Sialkot . . .	61	,,	Like Kubanka.
84	Gujrat . . .	61½	,,	Ditto.
106	Rawalpindi . .	60½	,,	Ditto.
116	Muzaffargarh . .	56½	,,	Clear long grain.
41	Amritsur . .	58½	47*s.* 6*d.*	
70	Lahore . . .	62½	,,	
93	Mooltan . . .	61½	,,	
140	Montgomery . .	59½	,,	
179	Dera Ismail Khan .	61½	,,	
148	Montgomery . .	61	47*s.* to 47*s.* 6*d.*	Roughish, dirty.
11	Karnal . . .	62	47*s.*	Like glassy Dantzig.
40	Kangra . . .	62½	,,	
65	Lahore . . .	59½	,,	Like Kubanka.
169	Dera Ghazi Khan .	60	,,	Dirty.
149	Montgomery . .	60½	46*s.* 6*d.* to 47*s.*	Ditto.
171	Dera Ghazi Khan .	60	,,	
63	Lahore . . .	60	46*s.* 6*d.*	Ricey.
76	Gujranwala . .	61	,,	Roughish.
162	Dera Ghazi Khan .	59½	,,	
42	Amritsur . .	59	46*s.*	Dirty.
125	Jhang . . .	59½	,,	Ditto.
27	Simla . . .	62	45*s.* 6*d.* to 46*s.*	Some shrivelled.
77	Gujranwala . .	57½	45*s.* 6*d.*	Ditto.
115	Muzaffargarh . .	57½	45*s.* to 46*s.*	Dirty.
175	Dera Ismail Khan .	60	39*s.* to 40*s.*	Half barley.
163	Dera Ghazi Khan .	57	36*s.* to 37*s.*	Mixed.
174	Dera Ismail Khan .	58½	,,	¼ barley.
182	Ditto . . .	57½	34*s.*	⅓ do.
167	Dera Ghazi Khan .	54½	32*s.* to 34*s.*	½ do.

The highest valuation for hard white wheat in the previous valuation was 42*s.* 6*d.*, whereas from 49*s.* 6*d.* to 50*s.* is the highest in the present. As no price for "Kubanka" was quoted on October 11, 1880, there being none in the market, the Indian "hard whites" cannot be compared with the type which they most resemble. The average price of all the samples in the valuation of 1879 from all India was 39*s.* 5*d.*, whereas the average value of the 67 samples now examined would be 46*s.* 9*d.*, or an advance of 7*s.* 4*d.* per quarter on the average price of the previous valuation. Allowing a reasonable discount for advance in prices, the average would still be above that of the valuation of 1879. The samples 163, 167, 174, 175, and 182 illustrate the effect which a large admixture of barley has upon the value of a sample in the London market.

C.—Soft red wheat.

The last valuation included 30 samples of this kind of wheat from the Punjab, whilst the present contains 31. All of these latter, except

three, would have fallen into Class I of that arrangement, whereas only two of the previous samples came under that class, so that all the soft red wheats are much superior to those of the 1879 consignment. The same mode is again adopted of tabulating in the soft red wheats according to gradations in value—

Numbers in Valuation List.	Locality.	Weight per Bushel.	Price per Quarter.	Remarks.
		lbs.		
108	Rawalpindi . .	62	48*s.* 6*d.*	
130	Bannu . . .	61½	„	Like No. 1 red winter.
136	Hazara . . .	62	48*s.* to 48*s.* 6*d.*	
34	Hoshiarpur . .	63	48*s.*	Like No. 2 red winter.
101	Rawalpindi . .	63½	„	Like No. 1 ditto.
104	Ditto . . .	61	„	Like Dantzig.
107	Ditto . . .	62½	„	
92	Shahpur . . .	62½	47*s.* 6*d.* to 48*s.*	Like No. 1 red winter.
131	Peshawar . . .	62½	„	Like No. 2 ditto.
103	Rawalpindi . .	62	47*s.* 6*d.*	
133	Peshawar . . .	63½	„	
189	Dehra Ismail Khan .	60½	„	
102	Rawalpindi . .	62	47*s.* to 47*s.* 6*d.*	
7	Delhi . . .	63¼	„	Mixed barley.
9	Karnal . . .	62¾	47*s.*	Like No. 2 amber.
21	Sirsa . . .	62⅝	„	
25	Ludhiana . . .	62	„	Like No. 1 red winter.
88	Shahpur . . .	60½	„	Like No. 2 ditto.
89	Ditto . . .	60½	„	Ditto.
90	Ditto . . .	60½	„	Ditto.
91	Ditto . . .	60½	„	Ditto.
97	Kohat . . .	60½	„	
135	Hazara . . .	61	„	
192	Dera Ismail Khan .	60½	„	
24	Amballa . . .	62½	46*s.* 6*d.*	Dirty.
38	Kangra . . .	58½	46*s.*	Ditto.
186	Dera Ismail Khan .	60½	„	
16	Rohtak . . .	59½	45*s.* 6*d.*	Mixed.
185	Dera Ismail Khan .	60½	45*s.*	Dirty.
184	Ditto . . .	60½	44*s.*	Ditto.
191	Ditto . . .	60½	„	Ditto.

It may be remarked here that the following paragraph which appears in the previous Report now requires modification :

"The prevalence of inferior varieties in the Punjab may be gathered from the fact that out of 30 samples of soft red wheat 10 are classed as inferior, being in value below 37*s.* the quarter, whereas out of 131 samples sent from the other parts of India only 11 are inferior."

If an addition of 5*s.* per quarter were made to this price, still the present 31 samples would none of them fall so low by 2*s.* per quarter, the two lowest samples being valued at 44*s.*, so that really none of them are equivalent to the class "inferior" alluded to in the foregoing paragraph.

D.—Hard red wheat.

In this group there is a most marked and characteristic advance in value of the samples reported on. It seems difficult to compare the low-

priced samples of "hard red" in the Report of 1879 with the high-priced samples just reported upon, even after making every allowance for advanced rates in the London market. Of the 59 samples, no less than 58 are valued at 43*s.* to 44*s.* and upwards. In the previous valuation the whole of the samples of this kind of wheat were classed in two groups, ordinary from 37*s.* to 39*s.* per quarter, inferior below 37*s.* per quarter—

Numbers in Valuation List.	Locality.	Weight per Bushel.	Price per Quarter.	Remarks.
		lbs.		
82	Gujrat	62¾	48*s.* 6*d.*	Round drop.
18	Rohtak	62½	48*s.*	Like finest Ghirka.
99	Kohat	59	„	
121	Jhang	61½	„	Like Ghirka.
1	Delhi	64½	47*s.* 6*d.*	Like red winter.
8	Gurgaon	63½	„	Like No. 1 Toledo.
141	Montgomery	60¾	„	
142	Ditto	61	„	
143	Ditto	61	„	
150	Rohtak	63½	„	
170	Dera Ghazi Khan	60	„	
180	Dera Ismail Khan	61	„	
105	Rawalpindi	61	47*s.* to 47*s.* 6*d.*	
126	Jhang	59½	„	Like pearl barley.
154	Rohtak	63½	„	
155	Ditto	63	„	
17	Ditto	61½	47*s.*	
31	Jullunder	62	„	
44	Gurdaspur	64	„	Like No. 1 red winter.
45	Ditto	62½	„	Ditto.
51	Sialkot	62½	„	
55	Ditto	63½	„	Ditto.
72	Ferozepore	62	„	
95	Kohat	61½	„	Like hard No. 1 spring.
100	Rawalpindi	60½	„	
151	Rohtak	62½	„	
152	Ditto	61½	„	
177	Dera Ismail Khan	60	„	
53	Sialkot	62½	46*s.* 6*d.* to 47*s.*	
87	Shahpur	59½	„	
153	Rohtak	61½	„	
5	Delhi	64	46*s.* 6*d.*	Like No. 2 red winter.
36	Hoshiarpur	63	„	
64	Lahore	62½	„	
85	Shahpur	61½	„	Small round.
119	Jhang	59½	„	
123	Ditto	62	„	Mixed.
20	Sirsa	61	46*s.*	
61	Lahore	61½	„	
62	Ditto	60½	„	Like Kubanka.
122	Jhang	60	„	
190	Dera Ismail Khan	61	„	
86	Shahpur	60½	45*s.* 6*d.* to 46*s.*	Mixed.
124	Jhang	59	„	Dirty.
187	Dera Ismail Khan	58½	„	
188	Ditto	59	„	
54	Sialkot	61½	45*s.* 6*d.*	Irregular.
73	Ferozepore	60	„	Ditto.

Number in Valuation List.	Locality.	Weight per Bushel.	Price per Quarter.	Remarks.
		lbs.		
96	Kohat . . .	57	45*s.* 6*d.*	
83	Gujrat . . .	59	45*s.* to 45*s.* 6*d.*	Dirty.
35	Hoshiarpur . .	60½	45*s.*	
79	Gujranwala . .	58	,,	
81	Jhelum . . .	58½	44*s.* 6*d.*	Dirty.
144	Montgomery . .	56	,,	Very dirty.
28	Simla . . .	61	44*s.*	Like rye.
80	Jhelum . . .	58½	,,	Dirty.
114	Muzaffargarh . .	54½	43*s.* to 44*s.*	Ditto.
120	Jhang . . .	55½	,,	Ditto.
181	Dera Ismail Khan .	57½	37*s.* to 39*s.*	Mixed.

In order to obviate any misconception which may arise in consequence of the present advanced prices in hard red wheats, and the high values quoted for the above samples, it may be repeated here that the present high prices for this class, of which the Ghirka is a type, are accidental, and due to peculiar circumstances, which are not permanent. In comparing the above prices with those of the previous Report, an allowance of nearly 8*s.* per quarter should be made for the altered condition of the market.

The detailed valuation is appended in the same form as in the previous Report.

M. C. COOKE.

November 1880.

Valuation of the Supplementary Samples of Wheat forwarded from the Punjab.

The values given are based upon the quotations ruling in the London Market on October 11th, 1880.
Key to letters showing colour and hardness—A, soft white; B, hard white; C, soft red; D, hard red.

Valuation Number.	Number on Sample as received.	Locality.	Description of Sample.		Valuation and Report.			
			Colour and Hardness.	Name.	Condition.	Weight.	Value.[1]	Remarks.
		Delhi District.					*s.* *d.*	
1	1	Barwala . . .	D	Red wheat, 1 . .	Clean . . .	64½	47 6	Extra No. 1, yellowish red, clean, fine.
2	2	Rajpur . . .	B	White, 1 . . .	Ditto . . .	64¼	48 0 to 48 6	Extra No. 1, clean, fine, longish, like Australian.
3	3	.....	A	Ditto, 4 . . .	Ditto . . .	64	48 0	Extra No. 1, clean, fine, round, like Chilian.
4	4	Bakthanapur . .	„	Ditto, 3 . . .	Some barley . .	62½	47 6 to 48 0	No. 1, soft, white, mixed with hard red, like Chilian.
5	5	Dyalpur . . .	D	Red, No. 2 . .	Ditto . . .	64	46 6	No. 2, clean, fine, round.
6	6	Sanpat . . .	A	White, No. 2 . .	Clean . . .	63	47 0 to 47 6	No. 2, clean, fine, long, white, like Californian.
7	7	.....	C	.....	Mixed with barley .	63¼	47 0 to 47 6	Extra No. 2, dirty, fine, long, red, like No. 1 Toledo.

[1] An average reduction of 4*s*. 6*d*. per quarter for classes A, B, and C, and of 8*s*. per quarter for class D, should be made in comparing these prices with those of the previous valuation.

Valuation of the Supplementary Samples of Wheat forwarded from the Punjab—continued.

Valuation Number.	Number on Sample as received.	Locality.	Description of Sample.		Valuation and Report.				
			Colour and Hardness.	Name.	Condition.	Weight.	Value.		Remarks.
							s.	d.	
		Gurgaon District.							
8	...	.....	D	Sarkh gandam .	Some barley . .	63½	47	6	Clean, fine, long, hard, red, like No. 1 Toledo.
		Karnal District.							
9	...	.....	C	Lal Gehun . . .	Clean . . .	62½	47	0	No. 1, yellowish red, small, like No. 2 Amber.
10	...	.....	B	Kunj . . .	Ditto . . .	63½	48	6	Extra No. 1, fine, long, clear, like No. 1 Kubanka.
11	...	.....	„	Sharoti Kathia . .	Ditto . . .	62	47	0	No. 2, dingy white, good, like glassy Dantzig.
12	...	.....	A	Dand Khani . .	Slightly weevilled .	62½	48	0	Extra No. 1, fine, white, like Australian.
13	...	.....	„	Safed Kathia . .	Clean . . .	61½	48	0	No. 1, good, white, medium, like Australian.
		Hissar District.							
14	...	.....	B	Paman	Weevilled . . .	59½	48	6	Extra No. 1, clean, long, white, like No. 1 Kubanka.
15	...	.....	A	Dand Khani . .	Much weevilled . .	62½	49	0	Extra No. 1, fine, ordinary-sized, like Australian.
		Rohtak District.							
16	...	Sikandurpur . .	C	Red	Mixed with barley .	59½	45	6	No. 2, dirty, fair, long, thin, yellowish red.
17	...	Rohtak . .	D	Ditto Garhi Sanpla .	Some barley . .	61½	47	0	No. 1, fair, stout, hard, red.

18	...	Ditto . . .	„	Red	Ditto . . .	62½	48 0	No. 1, very fine, strong, hard, red, like finest Ghirka.
19	...	Ditto . . .	A	Khurkhoda . .	Clean . . .	4	50 0	Extra No. 1, splendid white, like Australian.
		Sirsa District.						
20	...	.....	D	Nali	Clean . . .	61	46 0	Dingy red, No. 2 grade.
21	...	.....	C	Tangal . . .	Weevilled . . .	62½	47 0	Medium No. 1, red.
22	...	.....	A	Dand Khani . .	Clean . . .	62	48 0	Medium No. 1, white.
		Amballa District.						
23	...	.....	A	Dand Khani . .	Slightly weevilled .	63	48 0	Yellowish white, resembling Kubanka.
24	...	.....	C	Lal Gehun . .	Dirty . . .	62½	46 6	Soft, red, resembling No. 2, red winter.
		Ludhiana District.						
25	...	.....	C	Lal Gehun . .	Slightly weevilled .	62	47 0	Soft, red, resembling No. 1, red winter.
26	...	.....	A	Safed Gehun . .	Much weevilled . .	58½	47 0 to 47 6	Dirty, soft, white, No. 1.
		Simla District.						
27	...	.....	B	Lal Gehun, 1 . .	Mixed . . .	62	45 6 to 46 0	No. 2, hard, white, of irregular grain.
28	...	.....	D	Ditto, 2 . .	Fair	61	44 0	No. 2, hard, thin, red, resembling rye.
29	...	.....	B	Safed Gehun, 1 . .	Clean	64½	47 6 to 48 0	No. 1, hard, white.
30	...	.....	„	Ditto, 2. .	Fair	62	47 6 to 48 0	Hard, yellowish white, No. 1, ricey.

* An average reduction of 4*s*. 6*d*. per quarter for classes A, B, and C, and of 8*s*. per quarter for class D, should be made in comparing these prices with those of the previous valuation.

Valuation of the Supplementary Samples of Wheat forwarded from the Punjab—continued.

Valuation Number.	Number on Sample as received.	Locality.	Description of Sample.		Valuation and Report.			
			Colour and Hardness.	Name.	Condition.	Weight.	Value.*	Remarks.
							s. *d.*	
		Jullundur District.						
31	...	.....	D	Lal Gehun . .	Weevilled . . .	62	47 0	No. 1, hard, red, price quoted if free from weevil.
32	...	.....	B	Badanak . . .	Ditto . . .	63	48 6 to 49 0	Extra No. 1, stout, long, like Kubanka.
33	...	.....	„	Mundesi . . .	Slightly weevilled .	63	48 6 to 49 0	Ditto ditto.
		Hoshiarpur District.						
34	...	.....	C	Surkh Desi . .	Fair . . .	63	48 0	Mixed No. 1, red, like No. 2, red winter.
35	...	.....	D	Desi Lal . . .	Poor, mixed . .	60½	45 0	No. 2, hard, red.
36	...	.....	„	Badanak . . .	Fair	63	46 6	No. 1, hard, red, mixed with long yellow.
37	...	.....	B	Mundri . . .	Clean . . .	63½	48 0	Extra No. 1, hard, white.
		Kangra District.						
38	...	.....	C	Kangri . . .	Dirty . . .	58½	46 0	Fine, small, soft, red, like No. 2, Amber.
39	...	.....	B	Kunku . . .	Clean . . .	62	48 0	Mixed, No. 1, white.
40	...	.....	„	Mundri . . .	Dirty . . .	62½	47 0	No. 1, hard, white, ricey.
		Amritsur District.						
41	...	.....	B	Kunj . . .	Fair	58½	47 6	Hard No. 1, dingy, yellow, long grain.
42	...	.....	„	Lal Wadanak . .	Dirty . . .	59	46 0	Dingy, hard, white, No. 1.
43	...	.....	A	Safed Kanak . .	Clean . . .	64	49 0	Extra No. 1, soft, white, like Australian.

		Gurdaspur District.						
44	...	.....	D	Lal Gehun . .	Clean . . .	64	47 0	Extra No. 1, round, like No. 1, red winter.
45	...	.....	„	Lal Kanak . .	Ditto . . .	62½	47 0	Ditto ditto.
46	...	.....	B	Wadanak . . .	Ditto . . .	63½	48 0	Long, hard, white, like Kubanka.
47	...	.....	A	Ghoni . . .	Dirty, mixed . .	61½	47 6	Round, small, white, like Chilian.
48	...	.....	B	Wadanak . . .	Clean . . .	60½	48 0	Round, hard, white, like Kubanka.
49	...	.....	Mixed A and D	Gadur . . .	Weevilled . . .	61	46 6	Soft white, and hard red, mixed.
		Sialkot District.						
50	...	.....	B	Wadanak Lal . .	Clean . . .	61	48 6	Hard, white, extra No. 1, like Kubanka.
51	...	.....	D	Nikki Surkh . .	Fair	62½	47 0	No. 1, hard, red.
52	...	.....	B	Kunj Wadanak .	Clean . . .	62½	48 6	No. 1, hard, white, like Kubanka.
53	...	.....	D	Nikki . . .	Fair	62½	46 6 to 47 0	No. 1, hard, red.
54	...	.....	D	Berrerah . . .	Fair	61½	45 6	No. 2, hard red, mixed with hard white.
55	...	.....	„	Lal Kanak . .	Clean . . .	63½	47 0	No. 1, hard, red, like No. 1, red winter.
56	...	.....	B	„ Wadanak . .	Fair	61	48 0	Extra No. 1, hard, white, like Kubanka.
57	...	.....	„	Wadanak Chitti .	Slightly weevilled .	60½	48 0	Ditto ditto.
58	...	.....	„	Dagar . . .	Clean... . . .	60½	48 6	Ditto ditto.
59	...	.....	„	Safed Wadanak. .	Slightly weevilled .	62	48 6	Ditto ditto.
60	...	.....	„	Wadanak . . .	Clean . . .	61	47 6 to 48 0	Ditto ditto.
		Lahore District.						
61	...	Tahsil Chunian . .	D	Surkh Kanak . .	Fair... . . .	61½	46 0	No. 1, hard, red, mixed with white.
62	...	Ditto Kasur . .	„	Lal Kanak . .	Clean . . .	60½	46 0	„ 1, „ „ like Kubanka.
63	...	Ditto Chunian . .	B	Ghoni . . .	Fair	60	46 6	„ 1, „ white, ricey.
64	...	Ditto Sharkpur. .	D	Lal Wikki . .	Clean . . .	62½	46 6	„ 1, „ red.

* An average reduction of 4*s.* 6*d.* per quarter for classes A, B, and C, and of 8*s.* per quarter for class D, should be made in comparing these prices with those of the previous valuation.

Valuation of the Supplementary Samples of Wheat forwarded from the Punjab—continued.

Valuation Number.	Number on Sample as received.	Locality.	Description of Sample.		Valuation and Report.			
			Colour and Hardness.	Name.	Condition.	Weight.	Value.*	Remarks.
		Lahore District—contd.					*s.* *d.*	
65	...	Tahsil Kasur	B	Lal Rang	Clean	59½	47 0	No. 1, hard, clear, white, like Kubanka.
66	...	Ditto	A	Gabbar	Ditto	63	48 0	Small round, soft white, No. 1, mixed with red.
67	...	Ditto Lahore	„	Safed Kanak	Ditto.	62½	50 0	Extra No. 1, full-berried, like Australian.
68	...	Ditto	B	Wadanak	Ditto	62	48 0	No. 1, long, clear, hard, white, ricey.
69	...	Ditto Kasur	A	Dand Khani	Ditto	62½	49 6	Extra No. 1, small, white, like Australian.
70	...	Ditto Chunian	B	Paman	Ditto	62½	47 6	Long, clear, hard, white.
71	...	Ditto Sharkpur	Mixed	Dudi	Fair	58½	41 6	No. 2, mixed, white, shrivelled.
		Ferozepore District.						
72	...	.....	D	Lal Kanak	Slightly weevilled	62	47 0	No. 1, hard, red, small, round.
73	...	.....	„	Paman	Ditto	60	45 6	„ 2, „ „ mixed, irregular.
74	...	.....	A and D	Gurree	Fair, mixed	62½	46 6 to 47 0	„ 1, soft white, and hard red.
75	...	.....	A	Safed Kanak	Clean	63	48 6 to 49 0	Extra No. 1, soft, round, white, like Chilian.
		Gujranwala District.						
76	...	Tahsil Gujranwala	B	Daga	Clean	61	46 6	No. 1, long, hard, white.
77	...	Ditto Hafizabad	„	Busra Wadanak	Fair	57½	45 6	„ 2, hard, white, rough, shrivelled.
78	...	Ditto Wuzirabad	A and D	Dand Khani	Ditto	61	46 6	„ 1, soft white. and hard red, irregular.

79	...	Ditto Gujranwala .	D	Besara . . .	Dirty . . .	58	45 0	No. 1, hard, red.
		Jhelum District.						
80	...	.....	D	Lal Gehun . .	Dirty . . .	58½	44 0	No. 2, hard, dingy, red, thin, small.
81	...	.....	„	Ditto . .	Ditto . . .	58½	44 6	„ 2, „ red, round, small.
		Gujrat District.						
82	...	.....	D	Nikki . . .	Clean . . .	62¾	48 6¾	Extra No. 1, very fine, round drop, hard, red.
83	...	.....	„	Jowalla . . .	Dirty . . .	59	45 0 to 45 6	No. 1, hard, red, poor, irregular.
84	...	.....	B	Dagur . . .	Clean . . .	61½	47 6 to 48 0	Extra No. 1, hard, white, like Kubanka.
		Shahpur District.						
85	...	.....	D	Dudhi . . .	Dirty . . .	61½	46 6	No. 1, hard, red, small, round.
86	...	.....	„	Mohar . . .	Ditto weevilled .	60½	45 6 to 46 0	„ 1, hard, red, round.
87	...	.....	„	Dagur . . .	Clean . . .	59½	46 6 to 47 0	„ 1, „ „ longish.
88	...	.....	C	Soon . . .	Weevilled . . .	60½	47 0	„ 1, medium, red, like No. 2, red winter.
89	...	.....	„	Nukka . . .	Dirty . . .	60½	47 0	„ 1, soft, red, like No. 2, red winter.
90	...	.....	„	Kudhee . . .	Fair . . .	60½	47 0	„ 1, medium, red, like No. 2, red winter.
91	...	.....	„	Ootar . . .	Clean . . .	60½	47 0	„ 1, soft, red, like No. 2, red winter.
92	...	.....	„	Thull . . .	Ditto . . .	62½	47 6 to 48 0	Extra No. 1, soft, red, like No. 1, red winter.

* An average reduction of 4*s.* 6*d.* per quarter for classes A, B, and C, and of 8*s.* per quarter for class D, should be made in comparing these prices with those of the revious valuation.

Valuation of the Supplementary Samples of Wheat forwarded from the Punjab—continued.

Valuation Number.	Number on Sample as received.	Locality.	Description of Sample.		Valuation and Report.			
			Colour and Hardness.	Name.	Condition.	Weight.	Value.*	Remarks.
							s. d.	
		Mooltan District.						
93	...	.....	B	Jawali . . .	Fair, little weevilled .	61½	47 6	No. 1, hard, white.
94	...	.....	„	Rodi Makki . .	Fair	62	48 0 to 48 6	Extra No. 1, hard, white.
173	...	.....	„	Ghori . . .	Clean . . .	64	48 6 to 49 0	Small, short grain, like pearl barley.
		Kohat District.						
95	...	.....	D	Sorkhai Ratti . .	Fair	61½	47 0	No. 1, hard, red, like hard, No. 1, spring.
96	...	.....	„	Mandy Sorkai . .	Dirty . , .	57	45 6	No. 1, hard, dingy red.
97	...	.....	C	Sur Ghanam . .	Fair . . .	60½	47 0	No. 1, medium, red.
98	...	.....	A	Adspin Ghanam .	Clean . . .	61½	48 6 to 49 0	Extra No. 1, plump, round, soft, white.
99	...	.....	D	Kulanji . . .	Ditto . . .	59	48 0	Extra No. 1, hard, yellow.
		Rawalpindi District.						
100	...	Tahsil Attok . .	D	Surkh . . .	Fair	60½	47 0	No. 1, hard, red.
101	...	Ditto Murree . .	C	Gorin . . .	Mixed barley . .	63½	48 0	No. 1, soft, red, mixed with barley, like No. 1, red winter.
102	...	Ditto Rawalpindi .	„	Surkh . . .	Clean . . .	62	47 0 to 47 6	No, 1, dingy red, medium.

103	...	Ditto Murree . .	„	Narin, 1 . . .	Ditto . . .	62	47 6	No. 1, medium, red.
104	...	Ditto . . .	„	Ditto, 2 . . .	Ditto . . .	61	48 0	Extra No. 1, soft, yellow, like Dantzig.
105	...	Ditto Futteh Jang .	D	Surkh . . .	Fair . . .	61	47 0 to 47 6	No. 1, hard, dingy red.
106	...	Ditto Murree . .	B	Dag	Ditto . . .	60½	47 6 to 48 0	No. 1, hard, white, like Kubanka.
107	...	Ditto Murree . .	C	Gorin . . .	Clean . . .	62½	48 0	Extra No. 1, very soft red.
108	...	Ditto . . .	„	Ditto . . .	Mixed . . .	62	48 6	Extra No. 1, mixed white and red.
109	...	Ditto Futteh Jang .	B	Sufed . . .	Clean . . .	61½	49 0	Extra No. 1, hard, white, ricey.
110	...	Ditto Murree . .	A	Rodi Sufed . .	Ditto . . .	62½	50 6	Extra No. 1, very finest, plump, like Australian.
111	...	Ditto Attok . .	B	Chitti Attok . .	Ditto . . .	60½	48 0 to 48 6	No. 1, hard, white, small.
112	...	Ditto Rawalpindi .	„	Rodi Sufed . .	Ditto . . .	61	48 0	No. 1, hard, white, long.
		Muzaffargarh District.						
113	...	Mendhianwala . .	B	Red	Clean . . .	64	49 6	Extra No. 1, hard, white, like pearl barley.
114	...	.....	D	Desilal . . .	Dirty . . .	54½	43 0 to 44 0 if clean.	No. 3, hard, red, poor, thin.
115	...	.....	B	Kinghari . . .	Dirty	57½	45 0 to 46 0 if clean.	No. 2, hard, white.
116	...	.....	„	Paman . . .	Fair	56½	47 6 to 48 0	No. 1, hard, white, long, spindley.

* An average reduction of 4*s*. 6*d*. per quarter for classes A, B, and C, and of 8*s*. per quarter for class D, should be made in comparing these prices with those of the previous valuation.

Valuation of the Supplementary Samples of Wheat forwarded from the Punjab—continued.

Valuation Number.	Number on Sample as received.	Locality.	Description of Sample.		Valuation and Report.			
			Colour and Hardness.	Name.	Condition.	Weight.	Value.*	Remarks.
		Muzaffargarh District—contd.					s. d.	
117	...	.....	A	Valelan . . .	Clean . . .	63	50 6 to 51 0	Extra No. 1, white, plump, like Oregon.
118	...	.....	B	Pari	Fair	62	48 0	No. 1, dingy, white, hard.
		Jhang District.						
119	...	.....	D	Ratti Chiniotwala .	Dirty . . .	59½	46 6	No. 2, hard, red.
120	...	.....	"	Ratti Nahri . .	Ditto . . .	55½	43 0 to 44 0 if clean.	No. 3, hard, red, poor, shrivelled.
121	...	.....	"	Ratti Shorkolwala .	Clean . . .	61½	48 0	Extra No. 1, dark, red, hard, like Ghirka.
122	...	.....	"	Ratti Nahri Talki .	Dirty . . .	60	46 0	No. 2, hard, red.
123	...	.....	"	Ghaibari . . .	Mixed . . .	62	46 6	No. 2, hard, red and white.
124	...	.....	"	Jowali . . .	Dirty . . .	59	45 6 to 46 0 if clean.	No. 2, hard, red, thin.
125	...	.....	B	Koni, 1 . . .	Ditto . . .	59½	46 0 to 46 6	No. 2, hard, white, thin.
126	...	.....	D	Koni, 2 . . .	Ditto . . .	59½	47 0 to 47 6	No. 1, hard, red, like pearl barley.
127	...	.....	B	Sufed . . .	Fair	61½	48 0	No. 1, hard, white.

128	...	.....	B	Makin . . .	Clean . . .	64	49 6 to 50 0	Very fine, small, like pearl barley.
129	...	.....	B	Dagar . . .	Ditto . . .	61	48 0	Extra No. 1, hard, white, like Kubanka.
		Bannu District.						
130	...	.....	C	Marwali . . .	Much weevilled . .	61½	48 6 if free.	Extra No. 1, soft, red, like No. 1, red winter.
		Peshwur District.						
131	...	.....	C	Sarkai . . .	Slightly weevilled .	62½	47 6 to 48 0	No. 1, medium, red, like No. 2, red winter.
132	...	.....	A	Bowndi . . .	Clean . . .	63½	48 6	Extra No. 1, medium, white.
133	...	.....	C	Mowri . . .	Ditto . . .	63½	47 6	Extra No. 1, medium, red.
134	...	.....	A	Desi	Fair	59½	46 0	No. 2, soft, white, mixed with red.
		Hazara District.						
135	...	.....	C	Lal	Clean . . .	61	47 0	Extra No. 2, red, medium.
136	...	.....	„	.....	Ditto . . .	62	48 0 to 48 6	No. 1, medium, red, mixed, white.
137	...	.....	A	Sufed . . .	Weevilled much .	59	49 0 if free.	Extra No. 1, soft, white, like Spanish.
138	..	.....	„	Sufed . . .	Ditto . . .	60	49 0	No. 1, soft, white, like Spanish.
		Montgomery District.						
139	...	.....	B	Lal Gehun . .	Mixed with barley .	61½	49 0 if clean.	No. 1, hard, white, mixed barley.

* An average reduction of 4*s.* 6*d.* per quarter for classes A, B, and C, and of 8*s.* per quarter for class D, should be made in comparing these prices with those of the previous valuation.

Valuation of the Supplementary Samples of Wheat forwarded from the Punjab—continued.

Valuation Number.	Number on sample as received.	Locality.	Description of Sample.		Valuation and Report.			
			Colour and Hardness.	Name.	Condition.	Weight.	Value.*	Remarks.
		Montgomery District—contd.						
140	...	... ..	B	Paman . . .	Weevilled slightly .	59½	47 6	No. 1, hard, white.
141	...	.....	D	Surkh . . .	Clean . . .	60¾	47 6	No. 1, hard, red.
142	...	.....	„	Ratti . . .	Dirty . . .	61	47 6 if clean.	No. 1, hard, red, mixed, white.
143	...	.....	„	Lal Gehun . .	Ditto . . .	61	47 6 if clean.	No. 1, hard, red.
144	...	.....	„	Nehri jowali . .	Very dirty. . .	56	44 6 if clean.	No. 2, hard, mixed, red and white.
145	...	.....	A	Ghoni . . .	Mixed barley . .	61	48 0 if clean.	No. 1, medium, white.
146	...	.....	Mixed	Paman . . .	Mixed barley and weevilled.	60	45 0 if clean.	No. 2, medium, mixed.
147	...	.....	B	Ghoni . . .	Clean . . .	62	48 0 to 48 6	Extra No. 1 white, hard.
148	...	.....	„	Dand Khani . .	Dirty . . .	61	47 0 to 47 6 if clean.	No. 2, hard, white.
149	...	.....	„	Dandi . . .	Dirty . . .	60¼	46 6 to 47 0 if clean.	No. 2, hard, white.
		Rohtak District.						
150	...	Barodah . . .	D	Lal Gehun . .	Clean . . .	63½	47 6	No. 1, hard, red.

151	...	Jawahra . . .	„	Ditto . . .	Dirty . . .	62½	47 0 if clean.	Ditto.
152	...	Aholana . . .	„	Ditto . . .	Ditto . . .	61½	47 0 if clean.	Ditto.
153	...	Barodah . . .	„	Ditto . . .	Ditto . . .	61½	46 6 to 47 0 if clean.	Ditto.
154	...	Moundlanah . .	„	Ditto . . .	Ditto . . .	62½	47 0 to 47 6 if clean.	Ditto.
155	...	Aholana . . .	D	Ditto . . .	Ditto . . .	63	47 0 to 47 6	Ditto.
156	...	Ditto. . . .	A	Dand Khani . .	Clean . . .	62½	49 0 to 49 6	Extra No. 1, soft, white.
157	...	Norankhara . .	„	Ditto . . .	Dirty . . .	62½	48 6 to 49 0 if clean.	Extra No. 1, medium, white.
158	...	Khanpur Kalan .	„	Safed Gehun . .	Clean . . .	62	49 0 to 49 6	Extra No. 1, soft, white.
		Dera Ghazi Khan.						
159	...	Tahsil Dera Ghazi Khan.	A	Sufed . . .	Clean . . .	62	49 0 to 49 6	Extra No. 1, soft, white, stout, fine.
160	...	Tahsil Rajanpur .	B	Rodi . . .	Dirty . . .	60½	48 6 if clean.	No. 1, hard, white, mixed soft.
161	...	„ Tanapur .	„	Sufed . . .	Clean . . .	61½	49 0	Extra No. 1, hard, white.
162	...	„ Saugor .	„	Ditto . . .	Dirty . . .	59½	46 6	No. 2, hard, white.

* An average reduction of 4*s*. 6*d*. per quarter for classes A, B, and C, and of 8*s*. per quarter for class D, should be made in comparing these prices with those of the previous valuation.

Valuation of the Supplementary Samples of Wheat forwarded from the Punjab—continued.

Valuation Number.	Number on sample as received.	Locality.	Description of Sample.		Valuation and Report.			
			Colour and Hardness.	Name.	Condition.	Weight.	Value.*	Remarks.
		Dera Ghazi Khan —contd.						
163	...	Tahsil Rajanpur .	B	Sufed . . .	Very dirty . .	57	36 0 or 37 0	Fair, but spoilt with dirt, worth 46*s.* 6*d.* if clean.
164	...	„ Tanapur .	Mixed	Kinjhara . . .	Fair . . .	60	48 0	No. 1, soft, mixed.
165	...	„ Dera Ghazi Khan.	A	Sufed . . .	Do. . . .	60½	48 6	Extra No. 1, soft, mixed.
166	...	Ditto . .	B	Paman . . .	Clean . . .	59½	48 6	No. 1, hard, white, long.
167	...	Tahsil Rajanpur .	„	Goji . . .	About half barley .	54½	32 0 to 34 0	Grain, fair, worth 44*s.* 6*d.* if clean.
168	...	„ Tanapur .		Makira . . .	Clean . . .	63½	48 0 to 48 6	Extra No. 1 hard, white, like pearl barley.
169	...	Ditto . .	„	Paman . . .	Dirty . .	60	47 0	No. 2, hard, white, irregular.
170	...	Tahsil Saugor . .	D	Lal . . .	Fair . . .	60	47 6	No. 1, hard, red.
171	...	„ Dera Ghazi Khan.	B	Jawali . . .	Dirty . .	60	46 6 to 47 0 if clean 48 0	No. 2, hard, white.
172	...	Ditto . .	„	Nikki . . .	Clean . . .	63	48 6 to 49 0	Extra No. 1, hard, white, like pearl barley.

		Dera Ismail Khan.						
174	1	Tahsil Leiah . .	„	Zard Kanak Kuchawali.	¼ barley . . .	58½	36 0 to 37 0	46*s.* 6*d.* to 47*s.* if clean.
175	2	„ Irak . .	„	Ditto . .	⅓ barley . . .	60	39 0 to 41 0	Ditto.
176	3	„ Leiah . .	„	Zard Kanak . .	Fair . . .	60½	48 0	Extra No. 2, good, thinnish, hard, white.
177	4	„ Tauk . .	D	Sark Kanak . .	Clean . . .	60	47 0	Extra No. 2, good, ordinary, hard, red.
178	5	„ Bakkar . .	B	Pali Kanak, 1 . .	Fair . . .	59½	48 0	Extra No. 2, good, ordinary, hard, white.
179	6	„ Tauk . .	„	„ „ 1 . .	Ditto . . .	61½	47 6	Ditto ditto.
180	7	Ditto . .	D	„ „ 2 . .	Ditto . . .	61	47 6	No. 2, good, ordinary, hard, red.
181	8	Tahsil Kalachi .	„	„ „ . .	Mixed with barley .	57½	37 0 to 39 0	45*s.* 6*d.* if clean.
182	9	„ Bakkar .	B	„ „ 2 . .	⅓ barley . . .	57½	34 0	46*s.* 6*d.* to 47*s.*, if clean.
183	10	„ Tauk . .	„	„ „ Barik .	Fair . . .	60½	48 0	No. 1, good, ordinary, hard, white.
184	11	Painda Khan . .	C	Ratti Kachawali .	Dirty . . .	60½	44 0	Would be 47*s.* 6*d.*, if clean.
185	12	Village Dera . .	„	„ Pachawali .	Ditto . . .	60½	45 0	Ditto ditto.
186	13	Tahsil Bakkar . .	„	„ Kanak, 1 .	Fair . . .	60½	46 0	No 2, good, ordinary, soft, red.
187	14	„ Tauk . .	D	„ Kanak . .	Ditto . . .	58½	45 6 to 46 0	No. 2, good, ordinary, hard, red.
188	15	Ditto . .	„	Ditto . .	Ditto	59	45 6 to 46 0	Ditto ditto.
189	16	Tahsil Kalachi . .	C	Ditto . .	Clean . . .	60½	47 6	No. 1, good, ordinary, soft, red.
190	17	„ Dera . .	D	Ratti Damain, 1 .	Mixed with barley and earth.	61	46 0	Good stout grain, mixed with barley.
191	18	Ditto . .	C	„ „ 2 .	Ditto . . .	60½	44 0	Ditto ditto.
192	19	Tahsil Kalachi . .	„	„ Kanak . .	Some barley . .	60½	47 0	Ditto ditto.

* An average reduction of 4*s.* 6*d.* per quarter for classes A, B, and C, and of 8*s.* per quarter for class D, should be made in comparing these prices with those of the previous valuation.

Dated Cornhill Chambers, London, the 29th October 1880.

Demi-official from—ALEX. SMITH, Esq.,
To—J. R. ROYLE, Esq., M.D., India Office.

I BEG herewith to hand you note of valuation and classification of four parcels wheat samples received from you.

The values are taken as at 11th October 1880, and I enclose copy of Mark Lane Corn Exchange Price List of that date.

I may remark that many of these wheats are much superior to the bulk ordinarily received from India on this market both in point of 1° cleanness (*i.e.*, freedom from earth, earthy dust, weevil cutting, and admixture of other grain), 2° quality, and 3° size of berry, and this is particularly the case with 1°, the long-berried hard wheats, and 2°, the wheats classified as resembling Australian, Oregon, Spanish, and Californian.

Care and cleaning machinery seem to be greatly wanted both by the agriculturists and wheat-dealers in India.

If the growers would prepare a clean seed-bed and sow clean seed of the proper kind, such as any of those samples marked "Extra" as may be most suitable to the land in question, then it appears from the quality of these samples that much of the Indian soil is suitable for growing the most valuable descriptions of wheat, and that India could always command the top prices of the day for its wheat shipments.

During the last few months some shipments of very fine wheats have arrived here from Bombay showing a marked improvement in quality on those usually received from Calcutta.

Extract from the Proceedings of the Government of India, in the Home, Revenue, and Agricultural Department (Agriculture and Horticulture),—No. 7-152 to 165, dated 14th May 1881.

READ the following:

No. 30 (Stat. & Com.), dated India Office, the 17th February 1881.

From—Her Majesty's Secretary of State for India,
To—The Government of India.

[NOTE.—*See page 6.*]

ORDER.—Ordered, that copies of the above and of the "Supplemental Report on Indian Wheat" be forwarded in continuation of Resolution Nos. 8—406-17, dated the 28th October 1879, to the Local Governments and Administrations, with a request that the Government of India may be furnished with information on the points indicated in paragraphs 2 and 3 of the despatch.

Ordered, also, that copies of the same be forwarded to the Foreign Department for communication to the Chief Commissioner of Mysore and to other officers subordinate to it.

No. 1849, dated Fort St. George, the 1st December 1881.

From—C. G. MASTER, Esq., Secretary to the Government of Madras,

To—The Secretary to the Government of India, Revenue and Agricultural Department.

IN reply to your letter dated 14th May 1881, No. 7—153-165, and in continuation of my letter dated 17th August 1878, No. 1324, I am directed to forward the accompanying Proceedings [1] of the Board of Revenue dated 19th November 1881, No. 2887, with the earlier Proceedings dated 9th August 1881, No. 1664, referred to therein, which supplement the information regarding the cultivation of wheat in the Madras Presidency already given in the accompaniments to my letter above quoted.

[1] G. O. dated 1st December 1881, No. 1848.

Extract from the Proceedings of the Government of Madras,—No. 1848, dated 1st December 1881.

READ the following paper—

Proceedings of the Board of Revenue, Madras,—dated 19th November 1881, No. 2887.

READ again the following:—

Board's Proceedings dated 9th August 1881, No. 1664.
Board's Proceedings dated 3rd November 1881, No. 9626, Miscellaneous, recording G. O., dated 10th October 1881, No. 1501, Revenue Department.
Board's Proceedings dated 11th June 1878, No. 1551.

READ also the following:—

G. O. dated 5th November 1881, No. 3138, Revenue Department.
Letter from the Collector of Coimbatore, dated 5th October 1881, No. 232.
" " Collector of Cuddapah, dated 29th October 1881, No. 486.
" " Collector of Godávari, dated 21st October 1881, No. 327.
" " Collector of Kistna, dated 29th October 1881, No. 2627.
" " Collector of Kurnool, dated 19th October 1881, No. 469.
" " Commissioner of the Nílgiris, dated 5th October 1881, No. 139.

Remarks by the Board of Revenue, Madras.

THE foregoing letters, being replies to G. O. dated 30th May 1881, No. 856, are submitted to Government in continuation of Board's Proceedings dated 9th August 1881, No. 1664.

2. With reference to the remark of Government at paragraph 2 of G. O. dated 10th October, it is observed that the information alluded to, other than that now furnished, was afforded in Board's Proceedings dated 11th June 1878.

3. In their Proceedings of the 9th August last, the Board asked the following questions:—

(*a*) Whether the outturn of wheat, as given in the statement (col. 3) in Proceedings dated 11th June 1878, represented wheat husked or unhusked?

(*b*) Whether any information could be afforded regarding the alleged deterioration of wheat crops?

The following statement shows the nature of the answers given:—

	(*a*)	(*b*)
Godávari.	Unhusked; average* 125 lbs. per acre.	Soil said to deteriorate unless well manured.
Kistna.	Husked; average 346 lbs. per acre.	No information; little wheat grown.
Kurnool.	Husked; average 600 lbs. per acre.	No reason to suppose deterioration.
Cuddapah.	Unhusked; average 750 lbs. per acre.	No information; wheat not in favour.
Coimbatore.	Probably unhusked; average 516 lbs. per acre.	No information.
Nílgiris.	Husked; average 600 lbs. per acre.	No reason to suppose deterioration.

No reply has been received from Bellary.

4. With regard to these answers, the Board make the following observations. The returns from Godávari are clearly untrustworthy; no ryot would grow a crop with the prospect of obtaining so small a yield. The Collector of Coimbatore, while stating that the figure formerly given (516 lbs.) probably represents unhusked wheat, proceeds to assign reasons for believing that the average outturn to the ryot cannot be less than 500 lbs. of husked grain. The opinion of the Commissioner regarding the alleged deterioration of the crop on the Nílgiris is at variance with Mr. Robertson's belief that wheat grown in the Kaiti valley is not nearly so good now as formerly.

5. In modification of the statement made at paragraph 3 of the Board's Proceedings of June 1878, it would appear from the information now afforded that, with the possible exception of Kurnool, the yield from wheat grown upon the Nílgiris is considerably greater than the outturn on the plains.

Order thereon by the Government of Madras.

ORDERED to be forwarded to the Government of India, with reference to their letter dated 14th May 1881, No. 7—153-165.

* The figures entered under (*a*) are quoted from statement referred to.

Extract from the Proceedings of the Government of Madras,—No. 1664, dated the 9th August 1881.

READ the following :—

Proceedings of the Madras Government, Revenue Department,—No. 856, dated the 30th May 1881.

READ—

Extract from the Proceedings of the Government of India, in the Home, Revenue, and Agricultural Department (Agriculture and Horticulture),—No. 7—153-165, dated Simla, the 14th May 1881.

READ the following :—

No. 30 (Stat. & Com.), dated India Office, the 17th February 1881.

From—Her Majesty's Secretary of State for India,
To—The Government of India.

[NOTE.—*See page 6.*]

ORDER.—Ordered that copies of the above and of the "Supplemental Report on Indian Wheat" be forwarded in continuation of Resolution Nos. 8—406-17, dated the 28th October 1879, to the Local Governments and Administrations, with a request that the Government of India may be furnished with information on the points indicated in paragraphs 2 and 3 of the despatch.

Ordered also, that copies of the same be forwarded to the Foreign Department for communication to the Chief Commissioner of Mysore, and to other officers subordinate to it.

Order thereon by the Government of Madras.

FORWARDED to the Board of Revenue with the request that information may be obtained on the points indicated in paragraphs 2 and 3 of the despatch from the Secretary of State to the Government of India.

No. 659, dated the 20th July 1881.

From—W. R. ROBERTSON, Esq., M.R.A.C., Superintendent of Govt. Farms,
To—The Secretary to the Board of Revenue, Madras.

IN reply to the Board's Official Memorandum No. 978, dated the 11th instant, enquiring whether I can add anything to what is embodied in their Proceedings No. 1551, dated the 11th June 1878, on the culture of wheat in the Madras Presidency, I have the honour to observe that I can add but little to what is therein stated. The figures given regarding the amount of seed used, the yield, and prices obtained in the various districts are, I fear, valueless from the various reporters not having distinguished between "spelt" or "husk" wheat, and the "common" of "naked" wheat. A return of 500 lbs. of the former per acre may represent a smaller yield than a crop yielding 350 lbs. of the latter. Both of these varieties are grown in the wheat districts of South India. Spelt wheat is seldom met with decorticated in the bazar, it usually being sold in the husk.

2. As has been noticed in the Proceedings under reference, the wheat crop of South India is a very insignificant one. But I am decidedly of the opinion that the crop might be made to occupy a much more satisfactory position in the cropping of the Presidency were suitable means taken in the wheat districts to effect this, the most ready of which would be the distribution of good seed to be obtained from Central India.

3. The influence of lime in promoting the quality of wheat is well known in Europe, but I am not acquainted with a single instance in which a ryot has used lime for manuring his wheat land. The employment of bones as manure in any form is equally with lime unknown in the wheat culture of South India. Bones are readily procurable in most of the districts, and their use in a powdered state as manure for the wheat crop would tend to improve greatly the quality of the wheat raised; while generally ryots appear to take no heed as to the selection of the soils on which to grow wheat, light or heavy soils being indiscriminately used for this purpose.

4. In the Kaity valley and the other wheat-producing portions of the Nilgiris, there is ample evidence to show deterioration both in quality and in quantity of the wheat crops raised. The wretched samples now produced there of wheat of the common variety (*Triticum vulgare*) scarcely meet with a sale for making flour; the bakers being now compelled to obtain the wheat required in their trade from other parts of India. The Rev. Mr. Metz, who for nearly thirty years resided in the Kaity valley, informed me that at one period really good wheat was produced there, and for many years after the introduction of the crop by the former Collector of the district and the great promoter of its agriculture, the late John Sullivan, Esq. The same deterioration has been observed in the barley crop under similar conditions. Other instances of deterioration might be referred to, but this case is the most decided with which I am acquainted, and the facts of which are least open to dispute.

Remarks by the Board of Revenue, Madras.

COLLECTORS who furnished the replies contained in Board's Proceedings dated 11th June 1878, No. 1551, are requested to reply to the following queries:—

(*a*) Do the figures in column 3 of the statement there recorded represent husked or unhusked wheat? (*b*) Is any information available with reference to the alleged deterioration of wheat crops?

Extract from the Proceedings of the Government of Madras,—No. 553, dated the 25th May 1882.

READ the following:—

Proceedings of the Board of Revenue, Madras,—No. 3394 (Mis.), dated the 11th May 1882.

No. 151, dated the 15th April 1882.

From—F. A. NICHOLSON, Esq., Acting Sub-Collector of Coimbatore,

To—The Acting Collector of Coimbatore.

WITH reference to the Proceedings of the Board of Revenue, No. 1664,

dated 9th August last, I have the honour to bring to notice the outturns of wheat in the irrigated cutchery and other gardens—

Gardens.	Acres.	Yield in Salagays.	Remarks.
Cutcherry garden . .	2	28	No special care or manure.
A private garden . .	4	60	Well manured.
Do. do. (last year)	4	70	Do.
Do. do.	3	38	Moderately manured.
TOTAL . .	13	196	

The average may be taken as 15 salagays per acre, but I must add that the late Municipal Vice-President puts down the ordinary yield on highly-cultivated land as 18 salagays; the late season has been very trying by reason of drought.

The salagay equals 60 Coimbatore measures of 144 tolas of rice.

The present year's wheat weighs as follows:—

One Coimbatore measure wheat in husk weighs 86 tolas = 2·15 lbs.
One Coimbatore measure wheat without husk weighs 132 tolas = 3·30 lbs.
One Coimbatore measure wheat in husk cleans into $\frac{1}{3}\frac{1}{3}$ measure wheat without husk, weighing 62 tolas = 1·55 lb.

Hence the average yield being taken as 15 salagays, the outturn per acre is—

Wheat in husk 15 × 60 × 2·15 = 1,935 lbs.
Wheat without husk 15 × 60 × $\frac{1}{3}\frac{1}{3}$ × 3·3 } 1,395.
or 15 × 60 × 1·55. }

The English husked wheat weighs, I believe, 60 lbs.; hence the Coimbatore outturn = $\frac{1395}{60}$ = 32¼ bushels = 1 salagay of wheat in husk = 2¼ bushels.

Again, the selling price here of wheat without husk is about six measures (say 20 lbs.) per rupee; hence the value of the crop is (say) $\frac{1400}{20}$ = Rs. 70.

The figures seem to show that Coimbatore wheat is unduly light; this may be owing to the extraordinarily dry season which has had this effect on other grains also. But the introduction of a better wheat seems to be the direction in which improvement lies.

The yield is fairly good, but I think low for an irrigated garden crop as this is. I am told that from 18 to 20 salagays = 40½ to 45 bushels may be obtained by plenty of manure and water. Since the manuring practice is susceptible of improvement, the outturn might be still higher. It will be remembered that a crop of ragi has usually been taken off the ground previously in the same year.

The previously given figures of 500 lbs. wheat without husk were entirely wrong.

I request that this letter may be substituted for my No. 146 of the 5th current, which should be cancelled as imperfect.

No. 84, dated the 22nd April 1882.

Endorsed by the Acting Collector of Coimbatore.

SUBMITTED to the Board of Revenue for information, in continuation of this office No. 232, dated 5th October 1881.

Remarks by the Board of Revenue, Madras.

SUBMITTED in original to Government, in continuation of Board's Proceeding, dated 19th November 1881, No. 2887.

Order thereon by the Government of Madras.

ORDERED to be forwarded to the Government of India, in continuation of G. O. dated 20th December 1881, No. 1954.

No. 553A.

COPY to the Government of India, Revenue and Agricultural Department.

No. 505, dated the 20th January 1883.

From—J. MONTEATH, Esq., Acting Under-Secy. to the Govt. of Bombay,

To—The Secy. to the Govt. of India, Revenue and Agricultural Department.

As desired by the Government of India in their Resolution noted in the margin, I have now the honour, by direction of His Excellency the Governor in Council, to transmit the annexed statement furnishing the information required in paragraphs 2 and 3 of the despatch from the Secretary of State, No. 30 (Statistics and Commerce), dated 17th February 1881, regarding wheat cultivation in the Presidency of Bombay, including Sind.

7
No. 153-165, dated 14th May 1881.

2. The statement has been prepared from the reports received from the various district officers who were directed to report on the subject For the sake of convenience, the information supplied in these reports has been compiled in a tabular form.

3. The information given in the statement as regards the wheat cultivation in the various parts of the Deccan and the Southern Marátha Country and in the Gujarát Collectorates of Ahmedabad, Broach and the Panch Mahál, has been compiled from the results of careful experiments made from time to time by the officers of the Survey Department. These experiments were generally confined to the best kinds of wheat, it being considered that the information called for by the Secretary of State is only required as regards those varieties of wheat for which there is likely to be a demand for purposes of export.

4. The finest varieties of wheat are raised in the province of Gujrát especially in those tracts which are known as "bhál" and "bára," the former being the portion of the Ahmedabad Collectorate to the south

and south-west of Dholka, and the latter comprising the lands chiefly in the Broach Collectorate on the east coast of the Gulf of Cambay. Good wheat is also raised in the valley of the Tapti in Khándesh, in the Dohad and Jhálod Tálukas of the Panch Maháls and in the Kari Pargana of His Highness the Gáekwár's territory. In the Deccan and the Southern Marátha Country also a considerable quantity of wheat is grown under well irrigation. No wheat is grown in Ratnágíri, Kolába, and Kánara.

5. In the "bhál" lands, referred to above, wheat has been grown from time immemorial in the same soil without alteration and without manure, and though the outturn per acre is low and the quality inferior to what might be grown under more favourable circumstances, there is no evidence that it has deteriorated either in quantity or quality within living memory.

6. I am to forward herewith an extract from a letter from the Bombay Chamber of Commerce furnishing, as requested, information regarding the prices of the different kinds of wheat in Bombay and the shipping charges, &c. The remarks of the Chamber of Commerce contained in the last paragraph in the extract touching the cost of carriage of the wheat to the seabord will be referred for consideration in the Railway Department.

Statement furnishing Information on Certain Points connected

Locality in which variety chiefly grown.	Wheat grown.		Average yield per acre in lbs.		Price per maund of 40 lbs.		Soils in which grown.	Manure used.
	Name of variety.	Class.	Grain.	Straw.	Grain.	Straw.		
1	2	3	4	5	6	7	8	9
Various parts of the Deccan and Southern Marátha Country.	Bakshi .	First .	1,200	800	Re. A. P. 1 5 4	Re. A. P. 0 0 9	Generally on black loam or clayey loam highly retentive of moisture, found resting on a subsoil of brownish clay or trap. 2. A rich purplish black soil, mixed with fine sand, found sometimes resting on a soft and at others on a hard description of trap. 3. Sometimes on superior brown or red soils.	Yes, to the extent of 20 cart loads per acre. Sheep dropping are also used.
	Pivla . .	Second	425	350	1 4 0	0 0 9	Black, with a certain amount of gravel and lime.	Yes, every second year.
Dholka (Ahmedabad Collectorate).	Dándkháni .	First .	480	720	1 5 0	0 2 0	Black clayey . .	No
	Chassia .	Second	480	720	1 4 0	0 2	Ditto . .	No . .

with the Cultivation of Wheat in the Bombay Presidency.

Effect of manuring.	Cost per acre of manuring.	Irrigated or not.	Amount of seed sown per acre.	When sown.	When reaped.	Colour of grain.	Hard or soft.	Remarks.
10	11	12	13	14	15	16	17	18
Yield is increased one-fourth	Rs. 5	Either irrigated or dry-crop land, oftenest irrigated.	Lbs. 24	In October.	End of February.	White.	Hard.	Bakshi is the best kind of wheat raised in the Deccan and Southern Maratha Country. It is either black-bearded or straw-colour bearded. The grain is large and hard and contains a large proportion of gluten. This wheat, not being hardy, is not largely cultivated. *System of cultivation.*—The land is ploughed twice, once length and once crossways, with a six or eight-bullock plough, according to the nature of the soil. The land is then harrowed six times, thrice with a four-bullock harrow and thrice with a two-bullock harrow, and then sown with wheat. This is all that is considered necessary. It is not customary to raise wheat on the same lands annually. The rotation generally adopted on dry-crop land is as follows:—1st year jowari, 2nd year bájri, 3rd year wheat. On garden lands two crops are annually raised as follows:— 1st year. { 1st crop bájri. 2nd crop wheat. 2nd year { 1st crop bájri 2nd crop gram. } 3rd year { 1st crop bájri. 2nd crop wheat. Instead of wheat or gram for a second crop, onions, potatoes, &c., are sometimes raised.
Do.	5	Either irrigated or not.	30	Do.	Beginning of March.	Pale yellow.	Soft.	Pivla or Shetgahu is a variety of Bakshi. It has a straw-coloured beard; the grain is thick and rather round. It is sometimes called "Dáudkháni," which is the name of a variety well known in the Punjab and the North-West Provinces.
	...	No.	70	Beginning of November.	Do.	White.	Do.	The tract in which Dáukháni and Chássia wheats are grown is known as "bhál." It lies to the south and south-west of Dholka, ranging to Dhandhuka and the borders of the Nal. The soil is a friable clay, with more or less tendency to salt in it. The wheat crop is the single one of the season, the land being left fallow during the monsoon. It seems to have been found from experiment that irrigating wheat in this soil increases the growth of weeds and thereby diminishes the net yield of grain. Five or six ploughings are needed to clear the soil thoroughly of grass, &c., before the seed is sown.
	...	No.	70	Do.	Do.	Red.	Hard.	It is admitted that the use of manure would increase the yield of grain one-fourth, and probably the scarcity and cost of manure, if it had to be purchased, is the reason why manuring wheat in this tract is not practised.

Locality in which variety chiefly grown.	Wheat grown.		Average yield per acre in lbs.		Price per maund of 40 lbs.		Soils in which grown.	Manure used.
	Name of variety.	Class.	Grain.	Straw.	Grain.	Straw.		
1	2	3	4	5	6	7	8	9
...	Vádina Ráta.	Third.	900	1,400	Rs. A. P. 1 3 0	Rs. A. P. 0 2 0	Brown, sandy, and in black soil rice beds.	Yes, every year to the extent of 10 to 15 cart-loads.
Anklesvar (Broach Collectorate).	Hansia .	First .	480	720	1 6 0	0 2 6	Black clayey . .	No . .
...	Pota . .	Second	600	900	1 3 0	0 2 6	Black clayey in rice beds (not in large fields).	Yes, to the extent of 20 cart-loads per acre.
Jambusar (Broach Collectorate).	Hansia .	First .	340	500	1 4 0	0 4 0	Black clayey, chiefly in large fields; to a small extent in rice beds.	No . .
...	Katha .	Second	340	500	1 2 0	0 3 0	Do.	No . .
Dohad (Panch Mahals).	Katha . .	First .	950	1,000	1 0 0	0 0 6	Black clayey, chiefly, occasionally in brown loamy.	Yes; to the extent of 20 to 25 cart-loads per acre every second year.

Effect of manuring.	Cost per acre of manuring.	Irrigated or not.	Amount of seed sown per acre.	When sown.	When reaped.	Colour of grain.	Hard or soft.	Remar
10	11	12	13	14	15	16	17	18
Yield is increased one-fourth.	Rs. 10 to 15	Yes.	Lbs. 140	Beginning of November.	Beginning of March.	Mottled red.	Soft	The third class of wheat (Vádina Ráta) is but little grown and consumed. Though the actual yield is considerably more per acre than that of the first and second class, the larger quantity of seed sown, the greater cost involved in the necessity of using manure, and the increased cost and labour of irrigating the crop, seem to combine to place the grain in its lower class. These remarks and the other details in the body of the statement written opposite the entries for the Dholka Táluka apply also to the wheat grown in the Dhandhuka, Viramgám and Sánand Tálukas of the Ahmedabad Collectorate.
...	...	No.	60	Do.	Do.	Reddish	Hard	The tract in which wheat is grown in these Tálukas (as also all the other Tálukas of the Broach Collectorate which touch the sea-coast) is locally called "*bara*," and lies along the east shore of the Gulf of Cambay. The soil is a friable clay with a mixture of gravel and more or less saltish. It is naturally too humid to suit a monsoon crop of jowár or cotton, and it is quite the exception to raise any crop but wheat in this tract year after year. Irrigation is not practised and the wheat grown is technically called *chassia* (apparently because sown in furrows; *chas* = furrows), in contradistinction to wheat raised by irrigation from wells, which is grown in small square plots for thorough watering. This kind is called *Vadina Wadi*, meaning garden.
Yield is increased one-fourth.	6	No.	80	Do.	Do.	White.	Soft	
...	...	No.	40	Do.	Do.	Reddish	Hardish	
...	...	No.	40	Do.	Do.	Red	Hard	The Hansia wheat grown in the Jambusar Táluka is not pure, but has a slight mixture of Katha and Pota, both wheats of inferior quality; still it is considered the first class wheat of the district. The mode of cultivation in these districts is the same as that described under Dholka as regards its unirrigated wheats. Dúdukhání and Hansia are said to be one and the same grain differently called in North and South Gujarát. Hansia is supposed to drive its local name from Hansot (a *peta-Mahal* of Ankleswar Táluka).
Yield is increased one-fourth	5 & 6	No	80	Do.	Beginning of March up to beginning of April.	Red	Hard	The larger area of wheat cultivation in these districts is of brown loamy soil, and its wheat crop is generally (and in a favourable season always) a second crop following the monsoon one of maize. In the black soil tracts, which mostly lie low and along the banks of shallow streams, the wheat crop is, as a rule, the single one of the season, the land lying fallow during the monsoon. The wheat crop of the former kind is never irrigated, nor is it specially

Locality in which variety chiefly grown.	Wheat grown.		Average yield per acre in lbs.		Price per maund of 40 lbs.		Soil in which grown.	Manure used.
	Name of variety.	Class.	Grain.	Straw.	Grain.	Straw.		
1	2	3	4	5	6	7	8	9	
					Rs. A. P.	Rs. A. P.		
	Vajia . .	Second.	920	950	0 13 0	0 0 6	Brown loamy . .	Yes, to the extent of 20 to 25 cart-loads per acre every year.
Jhálod (Pauch Mahals.	Katha . .	First .	950	1,000	1 0 0	0 0 6	Black clayey, chiefly, occasionally in brown loamy.	Yes, to the extent of 20 to 25 cart-loads per acre every second year.
...	Vajia . .	Second.	920	1,000	0 13 0	0 0 6	Brown loamy . .	Do. every year .
Konkan .								
Thána . .	Hansia Bakshi Khapli.	...	...	...	60 to 75 per khandi (1,600lbs.)	...	Rabi lands are generally preferred.	...

Effect of manuring.	Cost per acre of manuring.	Irrigated or not.	Amount of seed sown per acre.	When sown.	When reaped.	Colour of grain.	Hard or soft.	Remarks.
10	11	12	13	14	15	16	17	18
	Rs.		Lbs.					manured, the manuring of the land for the first crop of maize sufficing for the wheat. In some of the tracts of black clayey soil in Jhálod, but not in the Dohad Taluka, the wheat crop is irrigated from roughly constructed lifts (*dhekudis*) cut in the face of the banks of the streams, or from wells dug in the fields, but not built up. The advantage of such irrigation is admitted by the ryots to equal an increase of one-fourth in the yield of both grain and straw; moreover, as the soil is in many parts shallow and stony, the possession of this water privilege enables a wheat crop to be raised where, in its absence, a very inferior crop (such as kodra or tal) would be grown and in a season of scanty rain be almost valueless. The mode of cultivation practised in the case of wheat growing in the black clayey soil is to plough the land twice after the first fall of rain, and leave it untouched until just previous to the time of sowing, when it is again ploughed twice. The seed is then drilled in and the *samar* (a kind of clod-crusher) is dragged over the furrows to cover the seed over. No further tilling is practised after that, nor is any weeding done. The straw is never sold in the market and the price per maund entered in the statement is merely nominal. Instead of plucking the plants up by the roots, the custom in these districts is to cut them some 6 inches from the ground. As regards the relative class value of Katha and Vajia wheat in the Jhalod Taluka, it is stated that, within the last year or two, Vájia, which was locally considered a poor grain and never eaten by the well-to-do natives, has got to be much more grown than Katha owing to a great demand for it in Bombay for purposes of export to England. The grain is said to be preferred in England because possessing much gluten. It is quite probable that in a few seasons Vajia wheat will supersede Katha and fetch a higher price. Another result of the Bombay demand for wheat grown in these districts is that a much larger area has been cultivated with wheat this season than with gram, and this will probably be the case in future whenever the later rainfall is seasonable and abundant.
Yield is increased one-fourth.	5 to 6	No . .	80	Beginning of November.	Beginning of March up to beginning of April.	Pale red.	Hard .	
Do. .	Do.	Occasionally in black soil.	80	Do. .	Do. .	Red .	Do. .	
Do. .	Do.	No . .	80	Do. .	Do. .	Pale red.	Do. .	
.....	...	.....	...	.....	.....	...	...	Wheat is very rarely cultivated in this district, the average area under the wheat cultivation for the whole district being about 80 acres. It is grown exclusively for home consumption.

Locality in which variety chiefly grown.	Wheat grown.		Average yield per acre in lbs.		Price per maund of 40 lbs.		Soils in which grown.	Manure used.
	Name of variety.	Class.	Grain.	Straw.	Grain.	Straw.		
1	2	3	4	5	6	7	8	9
Surat	...	...	15 Surat maunds per acre (420 lbs.)	...	Rs. A. P. ...	Rs. A. P. ...	Jiráit, black and Goriát soils.	Yes
ira	Dándkháni	First	10 Kacha maunds per acre (280 lbs.)	...	...	...	Rich black soil	Yes
ATIVE STATES.								
thiáwár	Potla Vajia. Kathá. Hansia.	First Second Third Fourth.	1,200 lbs. 500 lbs.	... ...	... ...	... ...	... Black soil	
ALANPUR AGENCY.								
npur	...	...	60 maunds in the best and 20 maunds in inferior soils.	...	...	...	Light soil, mixed with sand.	Yes
anpur	...	...	From 50 to 60 maunds per acre.	...	...	...	Black tenacious soil.	...

Effect of manuring.	Cost per acre of manuring.	Irrigated or not.	Amount of seed sown per acre.	When sown.	When reaped.	Colour of grain.	Hard or soft.	Remarks.
10	11	12	13	14	15	16	17	18
	Rs.		Lbs.					
...	...	Irrigated but sometimes Jirait lands are cultivated with wheat.	52	...	...	...	...	In black soils, if wheat is cultivated one year, the next year the land is cultivated with cotton, and third year again with wheat; and the same course is followed with regard to the Goriat land, except that the alternate crop is bajri, instead of cotton. If plentifully manured, the same land will yield wheat of the same quality and quantity for about 15 years. The quality of the crop is alleged to be inferior to what it was ten years ago, the grain being thinner and lighter than before.
...	....	Seldom requires to be irrigated.	70	...	...	...	...	Wheat is only produced to a limited extent in this district, about 15,000 acres being devoted to its cultivation. The soil is generally ploughed in the month of June and is allowed to remain fallow during the whole monsoon; about the end of October, the ground is again ploughed and then sown. The wheat is ready by the end of March. No rotation is followed. There is no evidence that the productive power of the soil is diminishing.
...	...	Irrigated . } Do. . }	...	...	...	...	...	The Potia wheat is said to be very highly esteemed. The Katha is much preferred as an article of food to the other varieties. For food purposes the wheat grown on non-irrigated or bhál lands is much preferred to that grown upon irrigated land and always commands a higher price in the market. The bhál (non-irrigated) land is never cultivated with any other than wheat crops and occasionally cotton, and more often than not the same land is sown with wheat year after year. There is no evidence with respect to the quantity of wheat raised which would tend to show that the productive power of the soil has begun to fail. A proper application of manure and a plentiful supply of water will, it is stated, always ensure a full crop of wheat. The bhál soil grows wheat without the aid of irrigation, but the crop is always larger if it can be watered once or twice.
...	...	Unirrigated . } Do. . }	...	...	...	Red		
			Mds.					
...	...	Yes . .	4	...	...	...	...	The crop is grown in the cold weather often on land from which bajri has just been reaped.
...	...	Not irrigated .	...	...	...	...	...	The best kind of wheat is produced in this State. During the monsoon the soil absorbs and retains sufficient moisture to enable wheat to be grown without irrigation and with very little preparation. The soil is said to be sufficiently rich to enable wheat to be grown without manure and fallow. The wheat thus grown is considered best by the natives of the State, and is in great demand among the better classes. It is generally believed both in Palanpur and Radhanpur that the productiveness of the soil is decreasing.

Locality in which variety chiefly grown.	Wheat grown.		Average yield per Acre in lbs.		Price per Maund of 40 lbs.		Soil in which grown.	Manure used.
	Name of variety.	Class.	Grain.	Straw.	Grain.	Straw.		
1	2	3	4	5	6	7	8	9
Cutch . .	Katha . .	First .	1,500 lbs. from irrigated land and 500 lbs. from unirrigated land.	...	...	...	Clayey, mixed, with sand.	Yes . .
Mahi Kantha.								
Nani Marwar .	(1) Soft red wheat. (2) Hard red wheat.	...	1,000 lbs. per acre in black soil. 800 lbs. per acre in red soil, 400 lbs. per acre in white soil.	...	...	...	Black soil, red soil, and white soil.	Yes; occasionally in black and red soils, but always in the white soil.
Sabar Kantha .	White hard wheat, soft do. Red hard Red soft .	...	Do. .	...	...	...	Black soil . .	Yes . .
		...	600 lbs. .	...	...	...		
Katosan . .	Red soft wheat.	...	1,400 lbs. .	...	...	...	Reddish sandy soil .	Yes . .
(1) Miraj (Senior Branch).	Khapli, Bakshi and Deshi or Shet.	...	(Khapli) from 4 to 20 maunds, average 10 maunds.	...	...	...	Khapli is grown in black cotton soil, sometimes in red soil (as in Jamkhandi) and in a mixed soil called "bhurkat."	Yes . .
(2) Miraj (Junior Branch).			(Bakshi) 6½ maunds of 80 pounds.	...	...	...	Bakshi is generally grown on black cotton soil and sometimes when there is sufficient rain, on black stiff mixed soil called "Karal."	Yes .
(3) Mudhol .								
(4) Jamkhandi.								
(5) Ramdurg .								
		...	(Deshi or shet) from 4½ to 6 mds.	...	...	...	Deshi or shet is sown as a dry crop in black cotton soil called "bhurkat."	

Effect of manuring.	Cost per acre of manuring.	Irrigated or not.	Amount of seed sown per acre.	When sown.	When reaped.	Color of Grain.	Hard or soft.	Remarks.
10	11	12	13	14	15	16	17	18
...	...	Yes . .	...	...	...	...	...	The land is ploughed and manured, and then allowed to lie fallow. It is then again ploughed and sown with wheat. There is no evidence that the productive power of the land is diminishing.
...	Rs. 10, including labour.	Yes . .	...	...	...	...	...	Both soft and hard red wheats are grown on black soil, the white sandy soil growing only the hard red variety. The black soil sometimes requires short fallows and rotation of other crops. The sowing season everywhere is November and December, and the harvest is ripe in March and April. There is no evidence of any failure in the productive power of the soil.
...	...	Yes.						
...	...	Yes.						
...	...	Yes . .	...	...	...	...	...	*Khapli* is grown in all the States named, except Rámdurg. The land is ploughed, then twice harrowed and manured. The seed is then sown in cross rows about a foot apart. In Jamkhandi and Mudhol a rotation of crops is followed, *viz.*, the first year cotton, the next year gram, the third year wheat again. In some cases the rotation crops used are chillies, sugar-cane and jowári, the last being the rotation crop used mostly in Jamkhandi.
...	...	Not irrigated .	...	...	...	...	...	*Bakshi.*—This variety requires cold weather and easterly winds. In the Miráj and Jamkhandi States, the ground is ploughed and harrowed before being sown. In some cases if a crop of jowári has been reaped the land must be harrowed two or three times between February and May. In the months of July and August after the rain has fallen, the ground is harrowed 8 or 9 times to remove all weeds. The rotation followed in the cultivation of this variety is, first year jowári, second year cotton and third year wheat. *Deshi* or *Shet.*—The mode of cultivation is the same as that followed in the case of Bakshi wheat. This variety is grown every year on black cotton soil, and every alternate year in the mixed soil, the rotation being with some rabi crop. In some places, however, as in the Kundgol State, the rotation for the mixed soil is, first year wheat, second year jowári, third year cotton, and the fourth year wheat. Wheat cultivation in these States is said to have fallen off, but this is attributed to other causes than to deterioration in the productive powers of the land.

Locality in which variety chiefly grown.	What grown.		Average yield per acre in lbs.		Price per maund of 40 lbs.		Soils in which grown.	Manure used
	Number of variety.	Class.	Grain.	Straw.	Grain.	Straw.		
1	2	3	4	5	6	7	8	9
(6) Sangli .	(1) Shet gahu. (2) Bakshi. (3) Bodka gahu.	...	1,370 lbs. in a good year.	...	...	...	Alluvial soil or black soils impregnated with lime.	...
	(4) Pan gahu. (5) Khapla.	...		...	...	...	Shallow soils, black, red or grey overlying the trap formation of the Deccan.	...
Kolhápur State	(1) Shet or Deshi. (2) Khapli or irrigated wheat.	...	From 400 to 800 lbs. Do.	...	...	...	The first variety is grown in black or red alluvial soil, and the second in black or red irrigated soils.	Yes . . .
Sind.								
Shikárpur .	(1) Gajarkáni	...	(1) from 5 to 15 maunds, average 10 maunds.	...	...	...	(1) Raised on permanent ground free of kalar (salt).	Yes . . .
	(2) Thori .	...	(2) 10 maunds.	...	...	...	(2) Do. . .	Yes . . .
	(3) Kudámi or Dembi.	...	(3) Do.	...	...	...	(3) Do. . .	...
	(4) Garhi .	...	...	...	...	...	(4) Low alluvial land on the river side.	...

Effect of manuring.	Cost per acre of manuring.	Irrigated or not.	Amount of seed sown per acre.	When sown.	When reaped.	Colour of grain.	Hard or soft.	Remarks.
10	11	12	13	14	15	16	17	18
...	...	Not . .	70	...	...	...	...	Land is ploughed every two or three years during the hot season. When sufficient rain has fallen to soften the clods, or the heat of the sun has rendered them dry and friable, the *kalao* (crusher) is drawn over the field, which is then overspread with manure, and the land is afterwards hoed from 5 to 7 times as each case may require. In October or the beginning of November, provided the soil is moist to the depth of about 9 or 10 inches, the wheat is sown by means of a drill. In the case of irrigated wheat, the sowing operations commence a little earlier, that is about September. The yield per acre shown in column 13 is for the best lands; on poor soils it is less than half. There is no *reliable* evidence to show that the productive powers of land are deteriorating.
...	...	Yes . .	160	...	...	...	...	
...	...	.....	...	...	...	...	...	The land is ploughed a little before the rains, and when it is sufficiently moistened with rain the clod is broken with a crusher, after which the land is manured. It is then sown in October or the beginning of November and the harvest is reaped in February. In some districts no manure is used. In the case of irrigated wheat the seed is sown in September or October by means of a drill.
...	...	Yes . .	1 md. & 10 srs.	...	...	...	...	Wheat being entirely a cold weather crop and the province of Sind being dependent chiefly for its irrigation on the inundation of the River Indus, the area under wheat cultivation is necessarily limited. Excepting the Shikárpur and Karáchi Collectorates, wheat is rarely cultivated in other parts of the province.
...	..	Yes . .	Do	...	...	...	...	*Gajarkáni.*—The land on which this wheat is grown is tilled during the inundation at least three times, and the wheat is then sown by a drill. The land is then irrigated and manured, the manure being used after the seed has germinated and the shoots are higher than 6 inches. This wheat is sometimes cultivated on the banks of Dhánds, or the river, and irrigated by means of a Persian wheel.
...	...	Yes . .	Do.	...	...	...	...	
...	...	Not . .	Do.	...	...	Red .	...	*Thori.*—This is considered the best wheat in this district. The mode of cultivation, irrigation and manure is the same that of Gajarkáni.
								Kuddmi or *Dembi.*—The mode of cultivation and manuring the same as in the case of the wheats named above.
								Garhi, or Red Wheat—This wheat grows on sailab land. Where the land is more sandy than usual and water is available, it is watered from a Dhánd or the river, in which case the outturn is larger. When Thori (No. 2) is used as seed in the sailab land the produce becomes red like garhi.

Locality in which variety grown.	What grown.		Average yield per Acre in lbs.		Price per maund of 40 lbs.		Soils in which grown.	Manure used.
	Number of variety.	Class.	Grain.	Straw.	Grain.	Straw.		
1	2	3	4	5	6	7	8	9
ráchi . .	(1) Thori Bhuri. (2) Garhi . (3) Thori (1st class). (4) Euri . (5) Khani (1st class). (6) Pumlum (7) Kauk Garhi (without barley mixed in it). (8) Do. (with barley).	...	...	...	...	...	Saílab, charkl, sadá-páni and baráni. As a rule, the most fertile soil free from salt, sand and weeds is selected; and the best crop is grown on land subm-rged by the river water or hill torrents during the inundation season. The silt deposited by the water serves as manure.	.....

Effect of manuring.	Cost per acre of manuring.	Irrigated or not.	Amount of seed sown per acre.	When sown.	When reaped.	Colour of grain.	Hard or soft.	Remarks.
10	11	12	13	14	15	16	17	18
...	...	.....	...	...	...	...	...	Four different processes are employed in the cultivation of wheat in this district, *viz.*, (1) the Sailabi, (2) Charki, (3) Sádápáni, (4) Baráni. *The Sailábi. Cultivation* is thus carried on. From the beginning of July, when the water rises, the land is sailabed, or flooded with water. When the water subsides, the land is ploughed three times every third day, and when it becomes soft it is levelled by rollers, after which the land is again ploughed, and the seed is sown by means of a drill. The seed sown per acre is from 64 to 96 seers, and the yield is from 8 to 12 maunds. *Charki cultivation* (wheel cultivation).—In this case the land is first cleared and watered twice by means of water-wheel, each time after four days. It is then ploughed and sown with seed thrown broadcast. The land is watered at an interval of 10 or 12 days until the grain is in ear. The quantity of seed required is about a maund and a half and the yield about 12 maunds per acre. *Sádápáni.*—The land is first irrigated by means of "*dháka,*" and then sown, after which it is ploughed twice and manured. It is then continuously watered until the grain is in ear. The quantity of seed sown is about three-fourths of a maund, and the yield about 10 maunds per acre of superior land. *Baráni* (land dependent on rain water.—There are two kinds of Baráni cultivation, *viz.*, "*Balo*" and "Band." The former is carried on in low ground, which retains rain water without bands, and the latter on high lands which require to be embanked to retain the water. When the water subsides the land is ploughed twice, and the grass or thick scrub jungle on it is removed; after this, the land is ploughed a third time; after this ploughing and drilling are used to throw the seed. The land then requires no more water.

Extract from a letter from the Chamber of Commerce, Bombay, dated 24th November 1882.

WITH regard to the enquiry in clause (1) of your letter, I have the honour to say that the Chamber have taken great pains to ascertain the prices of the different varieties of wheat referred to in the Government memorandum, but this has been attended with much difficulty, as the greater number of these descriptions of wheat are referred to under merely local names, and these are not known in this market. The Chamber, however, beg to subjoin, for the information of Government, a statement of the various kinds of wheat which are known here and which come from the places in this Presidency referred to by Government, with their present values, *viz.*—

AHMEDABAD DISTRICTS—

Chassia or Kâtha.—Small supplies, not liked. Hard red, Rs. 2·84 per maund of 82⅔ lbs., or Rs. 25 per 723 lbs.

Dudkhana.—Not liked; unsuitable for export; cannot give any exact quotation.

Ahmedabad soft (wheat).—Large bold red. The finest red wheat in Western India; largely exported; Rs. 3 per maund of 82⅔ lbs., or Rs. 27½ per 756 lbs.

NAVÁNAGAR DISTRICTS—

Send small, plump, short, red wheat like soft Ahmedabad, suitable for export; Rs. 3 per maund of 82⅔ lbs., or Rs. 27¼ per 756 lbs.

MOWA DISTRICTS—

Send hard red in small quantities; worth about Rs. 25 for 723 lbs, or 2·84 per maund of 82⅔ lbs.

[*N.B.*—From Gujarát we receive also some yellow peela wheats, but they are inferior to the Násik and Nagpur qualities.]

NÁSIK COLLECTORATE—

Kathia.—Hard red; Rs. 2·84 per maund of 82⅔ lbs.
Lascari.—Hard red, large grain with soft mixed; Rs. 3·12 per maund of 82⅔ lbs.
Peela.—Hard yellow wheats. The fine qualities all hard, the lower ones mixed with soft and Káthia, from Rs. 3·25 to Rs. 3·50 per maund of 82⅔ lbs.

} All exported largely to France and Spain.

Bansi.—Fine hard yellow wheat, principally used for local consumption, and, as a rule, too dear for export; Rs. 32 per 723 lbs.

SHOLÁPUR—

Khapla (bearded).—Large red and thin, not much received here, and not cared for; and no exact quotation.

KÁRWÁR, KUMTA, AND VINGORLA—

Káthia.—Hard red of good quality, worth Rs. 25 of 723 lbs., or Rs. 2·84 per maund of 82⅔ lbs.

Khapla (bearded).—Large red and thin, not much received here and not cared for; no exact valuation.

(2) With regard to the enquiry in clause (2) of your letter as to the shipping charges in this port, it is customary to clean and re-bag all the wheat received, and the expense of this, together with dock dues and all shipping charges, is as nearly as possible 3 annas and 2 pies per

maund of 82⅔ lbs. The freight on wheat from Bombay to England varies very much from month to month, and from year to year. Last year at this time it was as high as 45*s.* per ton of 16 cwt., which may be considered as a maximum; while this year it had at one time dropped to the unprecedentedly low rate of 15*s.* At the present time for immediate shipment it may be taken at 20*s.* to 22*s.* 6*d.* A fair average would, we think, be from 30*s.* to 35*s.*

(3) The following table shows the freight per Indian maund of wheat when the rate rules between 15*s.* and 45*s.* per ton of 16 cwt.:—

	s.	*d.*		
1 ton of 16 cwt.	at 15	gives 8·26	per Indian maund of	82⅔ lbs.
Do.	at 20	do. 11·02	do.	do.
Do.	at 25	do. 13·77	do.	do.
Do.	at 30	do. 16·52	do.	do.
Do.	at 35	do. 19·28	do.	do.
Do.	at 40	do. 22·04	do.	do.
Do.	at 45	do. 24·78	do.	do.

The Committee desire me to say that a large proportion of the wheats shipped from Bombay come from the Berars, the Central Provinces and Central India, and not from the parts of the country constituting the Bombay Presidency, to which alone the enquiries of Government refer.

They also beg respectfully to suggest that the attention of the Secretary of State should be called to the great fact which the experience of the wheat trade in this country is always bringing prominently forward, *viz.*, that to establish a permanent trade with Europe cheap carriage to the seabord is the thing which, above all others, is absolutely necessary. During four or five months of this year, owing to the low prices ruling at home, comparatively high freights and high railway carriage, the exports of wheat almost entirely ceased; but no sooner had freights fallen to the abnormally low level of 15*s.* and 20*s.* a ton than it began to revive. During the past two months wheat has been coming in again in fair quantities, and the Committee are fully satisfied that this is entirely due to the low freight. They would point out that, while the price of Indian wheat at home has declined 15 to 18 per cent. from the highest point of last year, the fall in the rupee price here, owing to the low freight, has only been from 10 to 12 per cent. Taking the best wheat as an example: during the large arrivals and shipments of last autumn, prices ranged from Rs. 35 to 36 per khandi, but during the monsoon of this year rates had fallen to Rs. 29 to 30, prices which apparently offered no inducement to the cultivators to send their produce forward. Although home markets have not risen, the recent fall in freights has enabled shippers to pay increased prices of from Rs. 32 to 33 per khandi, and this price has now induced cultivators to send forward their produce freely. Were freights to advance 10*s.* or 15*s.* per ton, exporters could not pay within Rs. 2 or 3 per khandi of the prices now current, and, as such an advance in freights is almost sure to take place soon, the Committee are convinced that the revival of the wheat trade, which we are now witnessing, will shortly come to an end. Coming as most of our wheat does from inland districts at a considerable distance from Bombay, the railway charge forms a very important item in cost; and if the Government wish to extend and encourage this trade, in no

way can they so well do so as by seeing that the railway charges are reduced to the very lowest paying rate. The cotton and seed trades of India, the Committee beg to point out, are in a very different position from the grain trade. The greater portion of the cotton and a large portion of the seeds grown in India are grown expressly for the European market, and these must be shipped and find a market there, whether the price (within certain limits) be high or low. With the grain trade it is totally different. Hitherto grain has chiefly been grown in India for local consumption, and it will only pay to ship it when the rupee price reaches a certain level. If it falls below a certain point, the holder stores it for future local consumption, and the export trade in it disappears entirely.

No. 1020T-F., dated Darjeeling, the 20th July 1882.

From—E. N. BAKER, Esq., Offg. Under-Secy. to the Govt. of Bengal,

To—The Secretary to the Government of India, Revenue and Agricultural Department.

I AM directed to acknowledge the receipt of your endorsement No. T—153-165, dated the 14th May 1881, forwarding copy of a despatch from the Secretary of State, and requesting to be furnished with certain particulars regarding the growth of the better classes of wheat in Bengal.

2. In reply, I am to say that the better classes of wheat are not grown in this province to any considerable extent. An abstract, however, of the replies received from the Commissioners of Divisions on the subject is submitted for the information of the Government of India.

Abstract of Reports received from the Commissioners regarding the Cultivation of Wheat in Bengal, with reference to the Enquiries made by the Secretary of State for India in his Despatch No. 30, dated the 17th February 1881, forwarded with a letter from the Government of India, No. 153—165T., dated the 14th May 1881.

Division.	District.	Description of the Soil on which Better Classes of Wheat are grown, the System of Cultivation followed, and the Average Weight of the Crop per Acre.	Evidence about the Failure of the Soil with reference to the Cultivation of Wheat.	Remarks.
Burdwan.	Burdwan .	*Nature of the soil.*—Wheat is generally grown on tolerably high ground, the best being clay with a large admixture of sand. *System of cultivation.*—The sowing takes place at the close of the rainy season. The land is first well ploughed and manured. Irrigation is seldom necessary. *The average yield.*—In the Culna sub-division one acre of land used, some twenty years ago, to yield from 20 to 24 maunds of wheat, but so little care has been given to the cultivation that 8 maunds are now the average outturn. In other parts of the district the outturn varies from 8 to 16 maunds.		

Division.	District.	Description of the Soil on which Better Classes of Wheat are grown, the System of Cultivation followed, and the Average Weight of the Crop per Acre.	Evidence about the Failure of the Soil with reference to the Cultivation of Wheat.	Remarks.
Burdwan—*continued.*	Bankoora .	*Nature of the soil.*—Wheat is produced on high lands by river-sides. They are generally of a dry and dusty nature. *System of cultivation.*—These lands have to be properly manured and ploughed before the seed is sown. At the time of sowing wheat, the soil must be very soft and half moist, being reduced to this state by tillage. Should it be too dry, it must first be ploughed and irrigated, and again ploughed so as to render it fit to receive the seed. The crop gets periodical irrigation till it is ripe. The wheat fields require periodical weeding, as well as irrigation. There are lands which are every year used for growing wheat; but only because they are properly taken care of, both in respect of irrigation and manuring. *The average yield.*—An acre of land, if regularly taken care of, yields up to 30 maunds of wheat.	The productive powers of the soil in some parts of the country have begun to fail only in regard to wheat, which requires a good deal of irrigation. The extent of land under cultivation of wheat is not much, and is gradually lessening.	
	Beerbhoom .	*Nature of the soil.*—Wheat is generally grown on the banks of rivers in alluvial deposits, but at a distance from rivers; a good clay soil is suitable for its growth. *System of cultivation.*—The preparation of the soil begins in October. The land is ploughed three or four times; a good deal of manure is used. Irrigation is also necessary. The crop would not survive the long periods of dry weather which occur at the time of its growth, if the land were not irrigated several times. Irrigation is necessary three or four times during the growth of the crop. *The average yield.*—It has been ascertained that during the last cold weather 5,762 beeghas of land were under cultivation of red and white wheat, yielding 6,880 maunds, or little more than 1 maund per beegha, or about 4 maunds per acre.		
	Hooghly .	*Nature of the soil.*—Wheat is grown in soil containing a slight admixture of sand. *System of cultivation.*—In case there be scarcity of rain, the crop is irrigated in January, the soil is seldom manured, but cow-dung and ashes are occasionally used. Wheat is not grown on the same land for several successive years. About 400 beeghas of land are annually cultivated. The better classes of wheat are not cultivated in this district.	In no case has the productive power of the soil been observed to deteriorate by reason of the cultivation of wheat.	

Division.	District.	Description of the Soil on which Better Classes of Wheat are grown, the System of Cultivation followed, and the Average Weight of the Crop per Acre.	Evidence about the Failure of the Soil with reference to the Cultivation of Wheat.	Remarks.
Presidency.	Nuddea .	*Nature of the soil.* The cultivation of wheat is confined to raised lands, composed of alumina, silica and sand in proper porportion, or what is called in Bengali *doasla* land; but this district, for want of alumina, and for the prevalence of sand in its under-beds, is generally ill-adapted to the growth of wheat. *System of cultivation.*—The wheat-growing lands are ploughed and harrowed about six times; and all this is done before the sowing season, the month of October. Wheat is never transplanted. There is little or no manuring of the lands, and no measures are adopted for their irrigation, except in years of extreme drought, though the advantages of both when resorted to have, it is stated, been proved. The wheat fields are here ordinarily weeded by a frame, fitted with wooden teeth, drawn by bullocks. *The average yield.*—The approximate produce of wheat in the district is about 150,000 maunds, and per acre 15½ maunds.	The productive power of the soil in the Ranaghat sub-division is reported to be failing, owing to constant cropping and to the land not being sufficiently manured. In Meherpore sub-division no such deterioration of the soil is reported owing to the annual deposits of alluvium by the Jellinghee and the Ganges. Repeated wheat-growing on the same land is found to be attended by a smaller yield.	The cultivation of wheat is neither general nor extensive in this division. There are four classes of wheat grown in this district: (1) the *doodhey*; (2) the *jamali*; (3) the *gangajali*; and (4) the *kheri*. The *doodhey*, or milky wheat, is the best; the grains of this class are large, though smaller than the *gangajali* and soft, yielding flour of the best white colour from 30 to 32 seers per maund, and selling at Rs. 2-6 per maund. The *jamali*, or reddish wheat, is less soft than the *doodhey*, but softer than *gangajali*. Its grains yield flour of an inferior whiteness from 28 to 30 seers per maund, and fetching a price of Rs. 2-2 to Rs 2-4 per maund. The *gangajali* wheat is very hard; the grains are long and large, yielding flour of a colour inferior to the other two kinds from 32 to 34 seers per maund. Owing to its large proportionate yield of flour, it sells at Rs. 2-7 to Rs. 2-7½ per maund. The *kheri*, or straw-coloured wheat, is the least valuable species, its grains are thin and blackish, yielding flour from 24 to 25 seers per maund, and selling at Re. 1-8 to Re. 1-9 per maund. The *doodhey* and *jamali* are grown in the Meherpore sub-division; the *jamali* in the sub-division of Chooadanga; and the *kheri*, and to some extent the *gangajali*, in the Kooshtea and Bongong sub-divisions.
	Moorshedabad.	*Nature of the soil.*—The land selected for cultivation varies according to the locality. In the higher parts of the district good strong lands are prefer-	It is very much the custom to crop the wheat lands year after year with the same crop. This is no doubt injurious to the soil, especially in the higher	There are some four varieties of wheat grown in the district, viz., *gangajali*, *doodhey*, *ja-*

Division.	District.	Description of the Soil on which better Classes of Wheat are grown, the System of Cultivation followed, and the Average Weight of the Crop per Acre.	Evidence about the Failure of the Soil with reference to the Cultivation of Wheat.	Remarks.
Presidency—*continued.*	Moorshedabad. —*contd.*	red. The better classes of wheat are cultivated on low lands which are subject to annual inundation. *System of cultivation.*—During the months of April, May, June, and July, lands are prepared by ploughing them several times. They are then submerged. After the inundation has subsided at the close of the rains, the lands are re-ploughed and the seed is sown broadcast. Lands enjoying the advantage of an alluvial deposit are, as a rule, sown with wheat annually, but those which have not that advantage are allowed to lie fallow for a season to recruit their fertility. *The average yield.*—The average yield per beegha in alluvial land is 10 maunds, or per acre 35 maunds; in ordinary lands 5 maunds per beegha, or 7½ maunds per acre.	lands. It is said also to be injurious to the alluvial lands, but that is doubtful, as the deposit of alluvial matter restores to the land what was taken by the former crop. It is rumoured that the yield per beegha is diminishing, and the land is becoming exhausted. But this does not appear to be more the case in wheat lands than in any other class of lands.	*mali*, and *kheri*. Of these, the two first are preferred and most largely used for local consumption.
Rajshahye and Cooch Behar.	Rajshahye .	*Nature of the soil.*—The soil best adapted for the growth of wheat is the alluvial deposit, known locally as *nurasa*. The best kinds of the crop are grown on lands on which there is a fresh alluvial deposit. *System of cultivation.*—The crop grows better on manured than on unmanured land. The manure used is generally cow-dung and ashes. It is, however, not generally used, as the idea is that manured land produces such an exhausting crop that the land requires to be manured again. Wheat is generally grown on irrigated lands. The land selected for wheat is ploughed once in the rains. It is allowed to remain fallow for about three months, and is then ploughed twice more and harrowed, after which the wheat is sown in the middle of October, and it becomes ripe and is reaped in April. *The average yield.*—The average yield is about 15 or 16 maunds an acre.	No evidence of deterioration of the productive power of the soil has been found anywhere in the division.	The wheat crop in this division is an insignificant one for purposes of commerce; the soil and climate are too damp to give hopes of a good return.
	Darjeeling. (Hill portion.)	*Nature of the soil.*—It is grown in plots of ground near homesteads, whatever may be the nature of the soil, though a black soil, free from stone, is preferred. *System of cultivation.*—The soil is well manured with animal refuse, for which purpose the cultivators tether their cattle on the land.	.....	One kind of wheat is grown on manured lands, and this is not of the best sort.
	Julpigoree .	*The average yield.*—The average yield is 10 maunds per acre. The small quantity of wheat that is grown in this district is grown on *poli*, or alluvial land, which is not irrigated.		

Division.	District.	Description of the Soil on which Better Classes of Wheat are grown, the System of Cultivation followed, and the Average Weight of the Crop per Acre.	Evidence about the Failure of the Soil with reference to the Cultivation of Wheat.	Remarks.
Rajshahye and Cooch Behar.	Pubna . .	*Nature of the soil.*—The soil of this district is not unsuitable to the growth of wheat, but there are crops which pay better. Wheat will grow on both high and low lands, but a better crop is produced on higher lands. The land used for wheat is called *dorus*, or two-crop land. *System of cultivation.*—The land is never irrigated, but is not unfrequently manured. Wheat is sown two years running on the same land without, it is asserted, injury to the soil. The cultivation of wheat follows the rice crop, and is reaped in time for the rice to be sown again. *The average yield.*—The average outturn per acre is said to be from 15 to 20 maunds.	There is nothing to show that the productive power of the land in this district is on the decrease, but rather the reverse.	
	Bogra . .	*The average yield.*—The average produce is about 15 maunds per acre. Two zemindars, however, report that the average yield varies from 5 to 21 maunds per acre.	The cultivators generally complain that the productive power of the land is greatly deteriorated by the cultivation of this crop, and that they do not, therefore, like to cultivate it at all. Perhaps this opinion may be accounted for by the manure not being used.	The wheat is cultivated to such a very limited extent in this district that information about it is of no practical use for general purposes.
	Rungpore .	*Nature of the soil.*—The ryots of this district generally cultivate wheat round their homesteads when they cultivate it at all. The crop thrives well on *poli* (sandy) land, and the richer and drier the soil the better the outturn. *System of cultivation.*—The land requires ploughing five or six times, and harrowing as many times, to prepare it for the reception of the seed. No weeding is necessary. The land is manured, but not irrigated. *The average yield.*—The average outturn per acre is about 7 maunds.	There is nothing to indicate that the productive power of the soil has begun to fail.	
Dacca.	Dacca . .	*Nature of the soil.*—The soil selected is sandy, generally *chur* land. *System of cultivation.*—The land is neither irrigated nor manured; no field is cultivated two years in succession. The seeds are sown broadcast in October and November, while the soil is still moist. It is then harrowed, and the wheat is reaped in March. *The average yield.*—The average yield per acre is from 5 to 8 maunds.	.....	A small crop is raised in the Manickgunge sub-division and in the Nawabgunge thana.
	Furreedpore.	*Nature of the soil.*—Light sandy loam. *System of cultivation.*—No care is bestowed upon the cultivation of wheat either in the selection of site, or in manuring, or in irrigating the land. *The average yield.*—The average yield per acre is said to be from 9 to 10 maunds.	.....	A little of inferior quality is grown in the sub-division of Goalundo.

Division.	District.	Description of the Soil on which Better Classes of Wheat are grown, the System of Cultivation followed, and the Average Weight of the Crop per Acre.	Evidence about the Failure of the Soil with reference to the Cultivation of Wheat.	Remarks.
Patna.	Patna . .	*Nature of the soil.*—Wheat is generally grown on soil mixed with sand. The *Dearah* lands are considered best suited for the purpose, as the annual deposits caused by inundation invigorate the soil and keep up its productive power. *In the South Gangetic districts* of the Patna Division the crop is grown both on the heavy clay soil locally called *kewal*, which is not improved by irrigation, and on the light sandy soil in low lands, where it is only grown with the aid of irrigation. *In the North Gangetic districts* there are three kinds of lands on which better classes of wheat are grown. These are (1) *samba* (in which the clay is mixed with sand, such land being generally near rivers and watercourses); (2) *matear* (in which the soil is black and rather hard); and (3) *bangar* (hard yellowish soil). *System of cultivation.*—The land is first manured, and then ploughed and harrowed several times before the seed is sown. The seed germinates after a week, and the field is weeded after a fortnight. The time for sowing is November, and that of harvesting is March. Under the best system of cultivation the land intended to be sown with wheat is left fallow for six months, say from April to September, during which period it is ploughed and harrowed over, after being thoroughly manured with cowdung and sweepings. But the process of manuring is not universal. It is generally followed in the North Gangetic districts, where the soil is not naturally well adapted for the cultivation of wheat. But in the South Gangetic districts, where the land is more congenial to the growth of this crop, manure is seldom used, and the agriculturists are only recently awakening to the advantages of manure. On the other hand, irrigation is rarely practised in the North Gangetic districts where the lands are naturally irriguous. In the South Gangetic districts irrigation is more freely resorted to except in the *Dearahs*. It is said that well irrigation is better suited than canal irrigation, and the reason is thus explained by Mr. Reid of the Sadwa Factory in Sarun:—"Canals water-log the subsoil and encourage excessive capillary action, which is injurious to wheat, whilst, on the other hand, the sponge is squeezed when well irrigation is resorted to, the sub-soil is	With regard to the question of deterioration of the productive power of the soil, the opinions of the district officers vary. Mr. Metcalfe, the Collector of Patna, says that there has been a gradual falling-off, not only in the quantity, but also in the quality, of the corn since the last 20 years, and he attributes this to the diminution in the productive powers of the soil. The Collectors of Gya, Shahabad, and Mozufferpore are of opinion that the soil deteriorates when there is no proper rotation of crops Mr. Boxwell, Collector of Durbhunga, thinks that the productive power of the soil has increased of late years, as the ryots seem to realize the advantages of manure and have used it more freely. Mr. Tobin, Collector of Chumparun, does not find any good ground for supposing that the quality of wheat has deteriorated, but he says that an opinion does exist that the outturn per beegha now is less than what is used to be formerly. The Commissioner is inclined to believe that there is much truth in what Mr. Tobin says. Mr. Reid, of the Sadwa Factory, who has practical experience in agriculture, thus expresses himself on this point: "There is not a doubt about the productive power of the soil having failed very considerably in North Behar from over-cropping. The chief ingredients in the food of plants are nitrogenous matter, phosphates, potash, and lime. The soils of North Behar fortunately are generally rich in carbonate of lime; nitrogen to a limited extent by a judicious system of cropping and cultivations is supplied to the soil. But, again, most of the nitrogen taken from the land by crops is wasted by the ryot's practice of burning the stalks and leaves, and the cowdung as fuel. Then the phosphates and potash which are removed by continuous cropping can only be returned to the soil in shape of farm-yard or artificial manures. Artificial manures, it is needless to say, are out of the reach of the ryot; and the little cow-dung and ashes he collects are generally thrown on to the field near his village, which little plot is nourished at the expense of the outlying lands of the holding. The fields and the growing crops bear the best testimony to the deplorable condition of the lands of the province, and these are	

Division.	District.	Description of the Soil on which Better Classes of Wheat are grown, the system of cultivation followed, and the Average Weight of the Crop per Acre.	Evidence about the Failure of the Soil with reference to the Cultivation of Wheat.	Remarks.
Patna—*continued.*	Patna—*contd.*	left open for the free admission of air, and the warm water from the well is spread sparingly over the surface of the field to find its way along with the fertilizing air to the roots of the plants." To ensure a good yield, wheat is generally taken after the leguminous crop of *arhar*, the cultivation of which enriches the soil with nitrogen, and thus prepares it for the healthy growth of wheat. Wheat is also grown on land from which a *bhadoi* crop has already been taken, but the produce is always inferior in such cases. It is not customary to grow wheat for many years in succession in the same soil, because it exhausts the productive power of the lands sooner than other crops. This opinion is so universal that "*tin guham khet usar*" (*i.e.*, three continuous wheat crops exhaust the powers of land or render it barren) is an ordinary saying among the agriculturists. *The average yield.*—The average yield of the crop varies from 7 to 20 maunds per acre according to the quality of the soil.	the facts which are brought prominently before me every day of my life in my work as a practical agriculturist." As regards the suitability of the soil of Behar to the cultivation of this crop, Mr. Hudson, the Secretary to the Indigo Planters' Association, has offered the following remarks:— "North Behar has never been a great wheat-producing country, and the quality produced is considered inferior. I am inclined to think that the poverty of the soil on which it is generally raised goes some way towards accounting for this; but speaking of Behar generally, I am of opinion that unsuitability of climate is the principal cause. It does not appear quite suited to this crop; perhaps the winter is not cold enough. I do not think wheat will ever be cultivated to any extent here for exportation. Other crops yield and pay better."	
Bhagulpore.	Monghyr and Bhagulpore.	*Nature of the soil.*—Wheat is generally grown on lands that are flooded by the Ganges and (in Bhagulpore) on the banks of the Kusi. *System of cultivation.*—The land is never manured, but Indian-corn is sown on these lands at the commencement of the rains, for it is said that lands improve as the stalks of the Indian-corn are allowed to remain and decompose. In these districts the soil of the tract of country lying on the north of the Ganges differs from that on the south. The former is more sandy and lighter clay and is subject to inundation. Here irrigation is never resorted to In the south, irrigation is only occasionally resorted to when the crop is grown on high lands. In Monghyr the land meant for wheat is never used for raising the autumn crop. In Bhagulpore the *doodhey* wheat is generally sown together with gram, and both are reaped at the same time. Here Indian-corn is also sown on the same land at the commencement of the rains, and wheat is grown on the same land for a long time. Lands formerly under poppy have been brought under wheat cultivation, and these lands are said to produce the best wheat. In Monghyr there are four kinds of wheat—*doodhey* (white as milk), *jamali*, *bhagra* and *burgahma*. On the hard soil	There is nothing to show that the productive powers of wheat lands in this division have deteriorated any more than those of the lands in which other crops are grown.	Generally it may be said that wheat will grow wherever there is clay and moisture. It is largely grown on the low-lying damp soil of North Monghyr and Bhagulpore, on the alluvial soil of the Ganges *Dearahs*, on the hard soil of South Monghyr, on the red sand and kunkur soil of South Bhagulpore, on the sandy deposits below the Rajmehal Hills, on the rich soil of Maldah, and on the terraced fields formed on the hill sides in the Sonthal Pergunnahs. According to the local features of soil, different kinds of seed are used, and lands are manured or irrigated. Wheat requires moisture, the *white kind* more than the *red sort*; or rather the white wheat is the produce of moist land; the red, of a drier soil.

Division.	District.	Description of the Soil on which Better Classes of Wheat are grown, the System of Cultivation followed, and the Average Weight of the Crop per Acre.	Evidence about the Failure of the Soil with reference to the Cultivation of Wheat.	Remarks.
Bhagulpore—*continued.*	Monghyr and Bhagulpore —*contd.*	of the district the first two are found to yield the best crop, and the seed is selected for thirsty grounds. *Bhagra* and *burgahma* are sown in clay soils, mixed with sand. The poorer lands are ploughed as often as eight to ten times. On the richer soils four ploughings are deemed sufficient. The seed is sown by hand, 30 to 35 seers per beegha being scattered. In the Bhagulpore district the soil is prepared for the *doothey* before the rains, and again at the close of the rains. The second class wheat is the yield of the sandy *Dearah* lands. The land lying to the south of the station and stretching about 12 miles east and west is the best soil adapted for wheat. *The average yield.*—In Monghyr the outturn is estimated at 21 to 31 maunds per acre on first-class soil, and 12 to 18 maunds per acre on second class soil. In Bhagulpore the average yield is estimated at 10 maunds per acre (here the wheat is generally grown with gram).		
	Purneah	*Nature of the soil.*—The best kind of wheat cultivated here, called the *doodhey*, is grown on a soil which is a mixture of sand and clay. The kind of wheat called the *jamali* is sown on ordinary land that is usually flooded by the Kusi during the rains. *System of cultivation.*—Here the land is required to be highly manured. The evil effects of Kusi inundations tell upon the soil, and without manure the yield is little. Ploughs are set to work in March, and the ploughings are continued till October, when the land is sown. But for no kind of wheat is the land irrigated. As a rule, lands are sown one year with wheat and are sown the following year with *bhadoi* paudy, and the two crops are sown alternately. Some lands are left fallow every second year. *The average yield.*—With good cultivation and favourable weather the yield of *doodhey* wheat is 20 to 21 maunds per acre, and of *jamali* about 13 maunds.		
	Maldah	*Nature of the soil.*—Here the soil is stiff and much subject to inundation. *System of cultivation.*—The soil is prepared in June or July, and again in October; the crop is cut in March. The best kinds of wheat are raised in lands which are manured with cow-dung, but not irrigated, and wheat alone is sown in these lands, though sometimes *kalai* is sown, and after it is		

Division.	District.	Description of the Soil on which Better Classes of Wheat are grown, the System of Cultivation followed, and the Average Weight of the Crop per Acre.	Evidence about the Failure of the Soil with reference to the Cultivation of Wheat.	Remarks.
Bhagulpore—*continued.*		harvested the lands are again prepared for wheat. *The average yield.*—The average yield is estimated at 18 maunds per acre.		
	Sonthal Pergunnahs.	*Nature of the soil.*—Lands near tanks or streams are generally selected for the cultivation. *System of cultivation.*—Those who can afford it manure their lands. Irrigation is resorted to when rain fails. Those who can afford it grow the same crops on the land for a long series of years. But generally wheat is grown alternately with other crops throughout the district. *The average yield.*—The average yield is estimated at 18 maunds per acre; but, owing to the poor nature of the soil and insufficient irrigation, the outturn is sometimes as low as 5 maunds per acre.	.....	Wheat is not extensively grown in this district.
Orissa.		*Nature of the soil.*—Whatever wheat is cultivated, it is confined to the banks of rivers which are enriched by alluvial deposits. *System of cultivation.*—The land is ploughed from two to seven times before being sown. The time for sowing is usually the end of October or the beginning of November. The quantity of seed required for sowing an acre of land varies from half a maund to a maund. Manure is seldom used, an occasional slight shower, or in its absence a little irrigation, being all that is necessary to mature the crop, which is generally harvested between February and March. *The average yield.*—The produce per acre depends more or less upon the nature and amount of silt deposit. It varies from 4 to 10 maunds.	It is said that the same land which has been continually used for cultivation of wheat for five to ten years without rotation or rest has not been found to have much deteriorated.	There is but an extremely insignificant amount of wheat, and that not of a very superior kind, grown in this division.
Chota Nagpore.	Singbhoom .	*System of cultivation.*—In the neighbourhood of Chyebassa the wheat lands are always kept moist by the natural drainage from the hills, and require neither artificial irrigation nor manuring. *The average yield.*—The average yield is from 9 to 12 maunds per acre.	.....	The extent of wheat cultivation is not considerable in this division.
	Manbhoom .	*The average yield.*—The average yield is from 12 to 24 maunds per acre.	.....	Here only inferior hard wheat is grown. The land is not usually cultivated with wheat during two successive seasons.
	Hazaribagh .	In the fertile valley of the Sukri river, the crop is raised every year on the same soil. *The average yield.*—The outturn in the Sukri valley is said to be from 30 to 40 maunds per acre; in other parts of the district from 10 to 15 maunds.	In this valley of the Sukri river no complaint of the deterioration of the productive power of the soil is known. In other parts of the district it is found that the same soil will not bear a crop beyond three successive years.	

Division.	District.	Description of the Soil on which Better Classes of Wheat are grown, the System of Cultivation followed, and the Average Weight of the Crop per Acre.	Evidence about the Failure of the Soil with reference to the Cultivation of Wheat.	Remarks.
Chota-Nagpore—*continued.*	Lohardugga.	*Nature of the soil.*—*Deshi* wheat grows best on *kewal* land (string lands), *dandih* on *pamra* lands (earth mixed with sand), *hurha* on *kewal* land, and *champakali* on *pamra* lands. The best wheat soil is *dab* land, *i.e.*, the land which has been under water for some months previously. The lands inside the *bund*, which contained water for irrigating the *dhan* land outside, are always used for wheat cultivation generally of the *dandih* kind. Water in these lands dries in September and October, and when not dry the water is let out by cutting open the *bund*, and the land thus formed is well ploughed for wheat. These lands do not require any extra manure. The rotten vegetable matters are sufficient manures. *System of cultivation.*— The uplands for wheat cultivation are at first well manured with cowdung. In the month of Asarh (June, July) they are twice ploughed in parallel lines and once diagonally. In this state they soak as much water as they can, and the action of the atmosphere and the rain makes the soil fit for receiving the seed in October. Such lands are called *choumas*; they must remain unoccupied by any other crop. In September or October the wheat soil, either *doob* or upland, are re-ploughed both in parallel lines and diagonally, and the seeds are sown. Three modes of sowing are prevalent in Palamow—(1) broadcast; (2) *sunta*; (3) *tari*. In the first method the seed is scattered over the land by a man. In the second a man goes before with a plough and another follows him dropping the seed in the hollows one inch deep made by the plough, taking care that the seeds are deposited in parallel lines in a continuous stream. In the third method the seed is deposited in deeper holes through a hollow bamboo of about one foot attached to the plough by the same man who drives the bullocks. When the land contains sufficient moisture, the second mode is resorted to with advantage. But when the land is dry, requiring the seeds to be sown deep, the third method is followed. The seeds sown are as specified below:— *Deshi* wheat per acre 33 seers pucca weight. *Dandih* wheat per acre 25 seers pucca weight. *Hurha* wheat per acre 25 seers pucca weight. *Champakali* wheat per acre 25 seers pucca weight.	From enquiry it appears that all lands in Palamow deteriorate if special care be not taken for having them renewed every year by letting them lie fallow and manuring them. Quantity and quality of wheat must suffer in case of deterioration of the land.	In the sudder subdivision of this district wheat is grown in very limited quantities on homestead lands and on the banks of a very few streams. In the sub-division of Palamow, four kinds of wheat are cultivated: (1) *deshi* wheat (red coloured, bearded); (2) *dandih* wheat (white coloured, bearded); (3) *hurha* wheat (coarse kind of red coloured wheat); and (4) *bharilu* or *champakali* (smooth wheat, white coloured).

Division.	District.	Description of the Soil on which Better Classes of Wheat are grown, the System of Cultivation followed, and the Average Weight of the Crop per Acre.	Evidence about the Failure of the Soil with reference to the Cultivation of Wheat.	Remarks.
Chota Nagpore—*continued.*		The wheats germinate in about a week. When they shoot four leaves they are well watered once; then after a month they require water again, and the water is given for the third time when about to shoot forth ears of corn. The wheats are generally sown in October, and cut in February or March,—*i.e*, in five or six months they are ready for use. *The average yield.*—The produce per acre in good irrigated land is 20 maunds, the average yield being 10 maunds.		
	Tributary Mehals.	*The average yield.*—The best outturn is said to be about 5 maunds per acre.	.....	The soil in some of the higher plateaux in these mehals are well suited for the cultivation of wheat, but the want of moisture seems to be a great drawback.

No. 2115, dated Camp, Lucknow, the 29th December 1881.

From—C. Robertson, Esq., Secy. to the Govt. of N.-W. Provinces and Oudh,

To—The Secy. to the Government of India, Revenue and Agricultural Department.

In reply to your letter No. 7—153-165, dated 14th May 1881, I am directed to forward, for the information of the Government of India, a report by the Director of Agriculture and Commerce on the cultivation of wheat in the North-Western Provinces and Oudh.

2. The report by Mr. F. N. Wright, which is referred to in paragraph 2, was forwarded to the Statistical Branch with my letter No. 2132A., dated 22nd July 1878. I am to add, with reference to your No. 344 (A. & H.), dated 16th November 1881, that, as the present report contains all the information available, the Director did not consider it necessary to wait till the next rabi had been cut before writing his report.

No. 496A.-T., dated Camp, Etah, the 20th November 1881.

From—W. T. Benett, Esq., Offg. Director, Department of Agriculture and Commerce, North-Western Provinces and Oudh,

To—The Secretary to the Government of the N.-W. Provinces and Oudh.

I do myself the honour of replying to your No. 1028 of July 1st, 1881, covering the copy of a letter from the Secretary of State (No. 30 of February 17th, 1881), in which a report on the cultivation of wheat was called for.

2. I would premise by saying that the results of careful investigation into the same subject which extended over eighteen months and occupied

the attention of every district officer in these provinces, were reported by Mr. Wright in this office No. 453A.-T. of June 28th, 1878. I would venture to refer to that for information on any points that may have been inadequately dealt with in the Note now submitted.

3. A demand is made for information on the following points :—

1. The nature of the soils on which the better classes of wheats are cultivated.
2. System of cultivation.
3. Are they raised on (1) irrigated (2) manured } land?
4. Has the land been long under wheat?
5. Average weight of crop per acre.
6. Is there any evidence of exhaustion of soil in (1) quality (2) quantity } of outturn?

4. On the first point it may be remarked that the best varieties of wheat in this country are invariably grown on a heavy loam-clay soil, are rarely used for wheat, and the red volcanic deposits of Bundelkhand produce none but inferior varieties. Every kind of loam is used, and fair crops obtained from very light land, but the best varieties require a good class of soil. The same thing is shown in the other great wheat-producing tracts of the world, such as the plains of Russia, and the alluvial valleys of Manetoba and Minnesota, where the largest outturn and the best varieties are obtained under much the same conditions of soil as produce the same result in this country.

5. Another essential to the production of the finest qualities of wheat in these provinces is a fairly severe winter. This appears to be the reason why, with careful cultivation, and an appropriate character of soil, the wheats of the Benares Division fall short of the excellence of those of Muzaffarnagar and Meerut.

6. The quality of the wheat depends as much on the character of the cultivation as on the soil. For the best varieties ploughing begins long before the rains, with any heavy shower that falls in May or April. The early ploughing is considered of special efficacy, and there can be no doubt of the great benefit which results from the exposure of the soil to the action of the dry air and intense solar heat during the months that precede the rainy season. The exact nature of the process which ensues has not been ascertained.

7. As soon as his kharif is sown, the cultivator again reverts to his wheat field, which he will usually plough once in July, twice in August, twice in September, and perhaps three times between the end of the rains and the commencement of November. The number of ploughings for first class tillage varies from eight to twelve, according to the character of the season and the nature of the soil.

8. The quality and outturn depend to some extent on a thorough pulverisation of the land in which the wheat is sown. This is one object of the frequent ploughings, and it is assisted by drawing a heavy log over the surface of the field shortly before sowing. The harrowing operation is often repeated after sowing where it has been found necessary to give an early watering. This is especially necessary with very light soils, where the water soaks readily at any spot where it is accumulated behind a small obstacle, to secure evenness and economy in irrigation.

9. Sowing commences about a month after the end of the rains. The ordinary amount sown is a maund to the bigha, or 120 lbs. to the acre. This corresponds almost exactly with the two bushels which are usually sown by the English farmer.

10. The best wheat land is usually situated by the village site, and is given the benefit of such manure (nightsoil and household refuse) as is available. The best manured land rarely gets an allowance of more than four tons to the acre.

11. Irrigation is required for the better kinds of wheat. Ordinarily three waterings of a depth of 2 inches each, or 25,000 cubic feet of water to the acre, are required between the sowing in October or early in November and the reaping in March. The first watering is, as a rule, given a month after sowing. If the rains have had an early ending and the surface has dried up before sowing-time commences, the field is watered before the seed is put in. This year, when there has been no heavy rain since the end of the first week in September, the slight subsequent showers have not altogether obviated the necessity of irrigation before sowing. Seed has germinated on dry land, but not with the same vigour and certainty as on neighbouring fileds which have been watered.

12. These remarks apply to well water; with canal irrigation the case is different. No exact figures are obtainable as to the depth of water supplied to irrigated land by canals, but a low estimate would put it at between a foot and a foot and a half for the wheat crop, or from twice to three times as much as is taken from wells. It is the common belief that well water is far more effectual than canal water, but this, too, is a point on which definite knowledge is wanting. Careful experiments are now being made on the effect of water from both sources at the Cawnpore Farm. It is sometimes supposed that there may be a difference between the fertilising power of the water of different streams, and I have heard anticipations expressed that the Sarda may supply better water than the Ganges has.

13. On the high, manured, and irrigated fields round the village site, which are the favourite localities for the cultivation of the best varieties of wheat, no systematic rotation is practised. The land is rarely cropped more than once in the year. Occasionally the spring harvest is omitted and an autumn crop of millets raised instead, and occasionally cotton takes the place of wheat.

14. As might have been expected, the best varieties of wheat are raised where the cultivators are most industrious and skilful, the style of cultivation highest, where there is abundance of water and manure, a rich alluvial soil and a moderately cold winter;—on lands like this there is not, I believe, the least sign of any falling-off in productive power. No doubt land recently reclaimed contains a superabundance of fertilising elements which is exhausted after a few years' cropping. But in a very short time a permanent grade of fertility is reached, and, as long as the natural resources of the soil are moderately re-inforced by manure, water, and exposure to the air, no further degradation is noticeable. There is much land on which, allowing for occasional devastation by war or famine, wheat must have been grown for centuries past.

15. A certain degree of exhaustion may be observed in places where the irrigation has outrun the manure supply. This is especially marked

when canals are brought to villages in which the means of irrigation had previously been limited. A large portion of the manjhar (or middle mark) which has before been devoted to inferior crops, and is too far from the village site to be reached by a sufficient supply of manure, is flooded for wheat. For the first few years the case is somewhat analogous to that of a recent jungle clearing. There is a sufficiency of mineral and organic matter in the soil to produce one or two good crops; but that is soon exhausted, no re inforcement by manure is possible, and the produce suddenly falls off.

16. From the returns published by the canal officers, it appears that during the ten years between 1867 and 1876 the average area watered for wheat was 38·7 per cent. of the whole area for which canal water was supplied. In the first year the figure was 41·4, and in the last 28·4; but there are considerable fluctuations throughout, and there is nothing to warrant the conclusion that wheat is being ousted by other crops for irrigated cultivation.

17. The extreme divergence which exists between the estimates from different officers of the average outturn of wheat may probably be traced to the different senses in which the question was understood. There are so many varieties and degrees of excellence in the method of culture, and both the quality and quantity of the outturn depend so largely on the style of cultivation that a categorical answer is hardly possible. Besides the high style of cultivation of which I have already given a brief description, in some districts wheat is sown on soils which will only produce the coarser varieties, and those with a low rate of return. In many places wheat is sown on the outlying lands where neither manure nor irrigation is available to any sufficient extent, and only a small return, and that to a great degree dependent on the winter rains, is looked for. Over very large areas wheat is sown in combination with inferior crops, such as barley, peas, or rapeseed, and its outturn does not amount to perhaps a half of the whole produce of the land on which it is grown. In some districts wheat is largely used as a second crop following the main crop of September rice. In places where this is done, if the sowing is facilitated by the occurrence of a few light showers at the beginning of October, large tracts will be ploughed up once and sown thinly broadcast. The cultivator is well satisfied if he gets a return of four or five fold. His main reliance has been on his autumn rice, and his wheat crop does not represent a large fraction of all he draws from his land. No average on all these various styles of cultivation could be struck with any approach to accuracy, nor, if obtained, would it be of the smallest practical value. My own belief is that 10 maunds to the bigha, or 22 bushels to the acre, is a fair average outturn to assume for land under fairly good cultivation, on which wheat is the only crop grown.

18. The results of some of the experiments on the Cawnpore Farm are not without interest in this connexion. Some years ago an acre was sown with a variety of pedigree wheat grown at Lucknow. The outturn was 25 bushels of grain. Twelve maunds of a coarse unmatured night-soil were used as manure, and the crop was irrigated seven times, giving it an amount of water which would have been probably most injurious to an ordinary variety of wheat. It was not an experiment on which any very safe conclusions could have been based as to the results of ordi-

nary cultivation. The writer who reported it in the *Indian Agriculturist* remarked that "the yield of wheat in this part of India on *gowhan* land (*i.e.*, near the village site) is equal to the average yield of most kinds of wheat at home. Sixty seers in India, and 2 bushels in England, each equal to 120 lbs., is an average amount of seed used to the acre, while the yield in the former case would be from 22 to 27 as compared with an average yield under ordinary cultivation in England of from 24 to 28 bushels."

19. Fairly accurate experiments were carried out in 1879-80 with the following main results. The average cost per acre was found to be—

	Rs.	A.	P.
Seed	2	0	0
Ploughing, clod-crushing, sowing, weeding, and reaping	6	8	3
Rent	6	4	0
Irrigation from canal	3	12	0
TOTAL	18	8	3

The labour was not under very careful supervision, and would cost a cultivator next to nothing, as it would be supplied almost entirely by himself and his family.

The price of manure varied with the kind and quantity given to each experimental plot. The net results were as follows :—

	Total cost of all kinds.			Outturn in bushels.	Value.		
	Rs.	A.	P.		Rs.	A.	P.
Bone superphosphate, 2 maunds	27	12	9	27·1	49	10	3
Ditto 3½ „	31	4	5	31·5	58	0	11
Dissolved guano 1½ „	34	6	5	23·7	43	11	2
Ditto 2 „	39	9	7	29·6	55	0	8
Green soiling with indigo	30	8	3	23·8	47	0	3
No manure	19	12	3	19·5	35	4	7

20. Each one of these plots had been irrigated twice. On unirrigated land the produce of grain on four plots averaged little more than 10 bushels to the acre,—that is to say, it was considerably less than half what was obtained from land which had had only two waterings.

21. The result of experiments with thick and thin sowing on land dealt with similarly with regard to ploughing, watering, and manure, was as follows :—

Sixteen lbs. of the finest white country wheat to the acre produced a crop of 1,206 lbs. (or 20 bushels) at a cost of Rs. 25-6-9, while 116 lbs. of seed (the ordinary native allowance) produced 1,626 lbs. (or more than 27 bushels) at a cost of Rs. 27-0-9. The result showed that, though the rate of return to seed was far higher with thin sowing, thick sowing was the more profitable operation.

22. In the succeeding year experiments were carried out on simila lines, but with variations in the kind and quantity of manure employed. The results per acre were—

Name.	Cost per acre of all kinds.	Crop in bushels.	Value.
	Rs. A. P.		Rs. A. P.
Green soiling	28 13 0	30	58 4 3
Cattle-dung, 240 maunds	33 7 0	21·7	42 12 8
Ditto, *plus* 240 lbs. gypsum	38 11 0	20·7	41 0 5
Ashes of 240 maunds dung	33 7 0	18·6	36 11 1
Poudrette, 240 maunds	33 7 0	31·4	62 1 11
Bone superphosphate, 225 lbs.	32 11 0	16·5	32 6 2
Bone dust, 320 lbs.	25 7 0	13·3	26 11 7
No manure	21 7 0	11·8	24 13 6

23. In all these cases the plots were ploughed twice in the European fashion, and watered three times, besides, as the season was one of exceptional drought, having been watered, in order to admit of the sowing.

24. By far the most efficacious manures by these trials were green soiling with a leguminous plant and poudrette, and this goes some way towards demonstrating that it is in nitrates, and not in phosphates, that the soil chiefly requires to be re-inforced. The excellent results obtained from superphosphate in the preceding year were almost certainly due to a previous and unexhausted dressing with nitrogenous manure.

25. The value of early ploughing was shown in a crop of barley, which having been ploughed for a month before the commencement of the rains, and exposed to the burning sun of May, yielded with three waterings, but altogether without manure, an outturn of 30·7 bushels to the acre. A neighbouring plot which had been trenched and used as a latrine for 80 days gave the enormous outturn of 47·1 bushels to the acre.

26. As far as these experiments prove anything, they support the view that, with the high and careful cultivation under which the best wheats are grown, the average produce is certainly not less than from 20 to 25 bushels to the acre.

No. 109, dated Lahore, the 26th April 1883.

From—C. L. Tupper, Esq., Junior Secretary to the Government of the Punjab,

To—E. C. Buck, Esq., Secretary to the Government of India, Revenue and Agricultural Department.

In compliance with the Resolution of the Government of India in the Home, Revenue, and Agricultural Department, No. 7—153-165, dated 14th May 1881, I am now directed by the Lieutenant-Governor to forward a report of the Financial Commissioner of the Punjab on the cultivation of wheat, together with a statement prepared in his office from materials furnished by certain district officers, bearing on the points mentioned in paragraph 2 of the Secretary of State's Despatch No. 30, dated 17th February 1881.

2. I am to express regret that so much delay should have occurred in submitting these papers, and that the information furnished is not more complete. The Financial Commissioner does not claim more than approximate accuracy for his return, which is, indeed, in some respects obviously defective. The Lieutenant-Governor will now direct the Agricultural Department to take up the question and to make from time to time, as opportunities offer, full enquiries as to the methods of cultivation, with a view to their improvement and to the production of classes of wheat more likely to find favour in the home markets. Particulars will also, as far as possible, be obtained as to the practice of the dealers and exporters, which, it is believed, are often such as to depreciate the value of consignments to Europe. The intermixture of wheat with other grains and its adulteration with various impurities are matters upon which it is desirable to have accurate knowledge, because the prospects of the export trade, no doubt, to a considerable extent, depend upon the production and sale of the pure commodity.

3. It is hoped that this Government will thus, in course of time, be in possession of more valuable information on the subject, and will be able to take steps to promote the production of the better classes of wheat and to discourage usages leading to the defects in the Punjab wheat supply noticed by Dr. Forbes Watson in paragraphs 10 and 18 of his Report of 1879.

4. In reply to the enquiry made in the 3rd paragraph of the Secretary of State's despatch, I am to say that, so far as is known at present, there is in the Punjab no evidence of failure in the productive power of the soil in respect of either the quantity or the quality of the wheat crop.

No. 408, dated Lahore, the 4th April 1883.

From—R. G. THOMSON, Esq., Junior Secy. to Financial Commissioner, Punjab,

To—The Junior Secretary to Government, Punjab.

IN reply to your No. 1293 of 25th November 1881, I am directed to forward, for your information, an abstract of the replies received from various Deputy Commissioners on certain subjects connected with wheat cultivation in the Punjab. I am to remark that it is not to be expected that any of these replies should be more than approximately correct, and in some cases the approximation is probably not very close.

2. If we reject from consideration such special crops as sugarcane, opium, garden-crops, tobacco and spices, we may say that about one-third of the whole cultivated area of the Punjab is regularly cropped with wheat. The acreage represented by this fraction is liable to considerable variation, due mainly to the character of the seasons, and the gradual increase of cultivation in general. But at present about 6½ million acres seem to be under wheat.

3. It may be taken as generally true that, when the above-named special crops have been provided for, all the best lands, and a considerable proportion of the inferior soil also, are devoted to the wheat crop. The most favourite soil for wheat is, perhaps, a rich and level loam easily worked and fairly retentive of moisture. But nearly all varieties of soil

are good under possible varieties of circumstance. Clay lands are excellent in dry years, and light sandy soils in wet ones. In some districts the quality of a soil depends upon artificial considerations, such as the degree to which a field has been levelled, banked, or furnished with a catchment area for water.

4. Wheat is grown indifferently upon irrigated and unirrigated lands, and upon soils that are manured and unmanured. Of late years it has become customary to treat a good deal of land with a slight dressing of manure, without actually bringing it into the class of manured lands. Most land regularly irrigated by canals or wells, or from ponds or other collection of water, is manured to the extent which the cultivator's means allow; and in some districts of heavy rainfall, part of the unirrigated land is also manured. In some of the drier districts, however, manure would be positively injurious to the cultivation of rain crops, and is never used. On lands which depend on floods from rivers or hill torrents, the flood water carries, in suspension, a silt which serves the purpose of manure. In ordinary circumstances, a thorough manuring will improve the yield from 30 to 50 per cent. Irrigation with manure may be expected to show an improvement of 75 to 100 per cent. in the outturn as compared with that on unmanured barani land. There is, too, of course, a greater certainty of there being an outturn. But all these comparative values differ considerably from year to year, and also in different localities.

5. An average produce estimate for the Punjab is almost an impossibility. One year with another, it is probably rash to expect more than 5½ maunds an acre from unmanured rain lands, 7½ maunds from manured rain lands, and 10 to 14 maunds on lands manured and irrigated. Of course the greater certainty of the crop on the last class increases its comparative value on a long series of years. The yield on *sailab* (flood) lands varies very greatly. The average harvested is, very roughly speaking, 6½ maunds on a series of years. The crops are generally more secure than those on barani lands.

6. The class of wheat most commonly cultivated in the Punjab is a soft, red, bearded variety; white and beardless kinds are also grown in most districts, but can hardly be said to be in general cultivation. They are, perhaps, most frequently found in the East and South Punjab, in the belt of country under the hills, and in parts of the Mooltan Division. But information on this point is somewhat uncertain and incomplete. The common red wheat is generally known as "kanak surkh" or "lal kanak" in the Punjab Proper, and as "lal gehyun" in the Delhi and part of the Cis-Sutlej territory. There are, of course, a good many local names for so-called varieties; but these are comparatively unimportant, and are often confined to small areas.

7. A large proportion of the canal-irrigated area, and from ⅕ to ¼ of the area irrigated by the wells, is double-cropped, and gives a wheat crop and an autumn crop regularly every year. Other wheat lands are generally cultivated on one or other of two courses. The first, which is generally followed by the best cultivators, is a two-year course, in which a wheat crop is first taken and immediately succeeded by an autumn pulse crop, after which the land is fallowed for a year. The other system simply consists in separating the lands for the spring crop from those for the

autumn crop, and then maintaining the separation. The spring crop lands give a wheat crop every spring, and lie fallow during the autumn season. The autumn lands lie fallow during the spring, and give a pulse or other crop in the rainy season.

8. The method of cultivation is essentially the same everywhere, but the skill and labour used in carrying it out are liable to indefinite variation, partly due to the differing character of cultivators, partly to the local circumstances, and partly to the rotation of crops in common use. Reduced to its barest elements, the system is to plough and cross-plough as often as possible, then harrow, then sow the seed through a drill attached to the plough, and then again plough over. The number of ploughings varies greatly—once is enough for a Saiad, while a Jât thinks ten times hardly sufficient. The times and manner of using irrigation vary considerably, and depend upon a good many different factors.

Statement of Wheat Cultivation in certain Districts of the Punjab.

Statement of Wheat Cultivation in cer

[ABBREVIATIONS.—SW *Soft White*; HW *Hard*

1	2			3	4	5
District.	Number and Description of Specimen.			Is it commonly grown in the district or confined to a special locality?	Nature of soil on which grown.	System of cultivation.
	Value No.	Colour and hardness.	Name.			
Hissar.	15	SW	Daud khani .	Not stated . Specimens sent were from Hansi Tahsil.	Rousli and Dakhar or Mattiar.	The land is first ploughed in July and again 6 or 7 times on various occasions until October. It is watered in November. This operation is called *plawar*. The land is again ploughed twice, then smoothed with a roller, then ploughed again, and the seed sown through a tube attached to the plough handle. After 25 or 30 days it is again watered, and this is repeated until the plants begin to appear fortnightly where irrigation is by lift, and every 25 days where it is by flow. In February, when the ears have appeared, water is given weekly until the ears begin to mature, when it is stopped and the crop allowed to ripen, which takes place about April.
	14	HW	Paman . .	As above; is more abundant than Daud khani.	As above. . .	As above. Except that this wheat ripens later than the other.
Rohtak.	18	HR	(1) Kunj .	Only in Gohana Tahsil.	Mittiar (rich loam) soil.	This is grown only on canal irrigated land. The land is ploughed once in June and twice in each month, July, August, September and October, being smoothed with a roller each time after ploughing. In November the land is watered and twice ploughed and smoothed, then again ploughed, and the seed sown through a tube attached to the plough handle. The previous year's seed, cleaned of dust and chaff, is used. Nothing is then done for a month, as, if watered, a good shoot does not form. The first supply of water (called *kor*) is given with great care that it covers the whole field. Twenty days after *kor* the land is again watered, and again 40 days after the 2nd watering. Then the crop is allowed to ripen and is cut in April.
			(2) Kalher .	In all tahsils .	Grown on Rousli Barani lands. (light loam.)	The land is first ploughed once in May, then again in June, when if rain has fallen it is levelled with the roller. It is then ploughed again 3 times in September, and the seed sown in October, at the end of the month; the roller is then run over the field. The crop is ready for cutting a fortnight earlier than on irrigated land.
	19	SW				
	156	SW	Daud Khani .	In Tahsil Gohana only.	Rousli (light loam) and Mattiar (rich loam) soils, canal irrigated.	As for 18 HR., hard red (kunj) wheat . .
			The Deputy Com	missioner also	gives a description of	other kinds of wheat not mentioned in the
			Gundum sufed, or hard white wheat.	Is grown in Tahsil Rohtak and Sampla.	Only on fairly good Rousli soil, canal irrigated.	As for soft white wheat above . . .

tain Districts of the Punjab.

White; SR *Soft Red;* HR *Hard Red.*]

6	7	8	9	10
Irrigated or unirrigated.	Manured or unmanured.	Has the land long been cultivated with wheat? What is the system as to fallows? Is the land do-fasli, and if so, what crop follows wheat?	Average produce.	Has the productive power of soil begun to fail.
Irrigated and manured. The best crops are raised on irrigated and manured lands. Manuring being necessary to maintain the productive power of irrigated land.		Carefully manured land can remain under wheat cultivation 5 or 6 years, but practically the crops are changed every 2nd year. Wheat is considerd the strongest crop, and to maintain the productive power of the land it is necessary to change this crop for some other, such as jowar, wheat being sown the 2nd year.	The average weight per acre of all kinds of land is 7 maunds. In Hansi and Hissar, where land is freely irrigated, it is not less than 10 maunds.	Nothing to show this with respect to quantity and quality of wheat crops on canal-irrigated land after 25 years, if irrigation is continuous and abundant.
As above . .	As above . .	As above	Not stated . .	Not stated.
Irrigated. All irrigated lands are manured, and nearly all manured lands irrigated.	Manured.	The wheat crop is the chief staple of the district, and lands now growing wheat have been so used for a long time. Wheat lands are never allowed to remain fallow. They frequently do not grow another crop until the season for wheat comes round; but they never receive an entire year's rest.	14½th maunds per acre is the average weight of produce; 1 maund of seed is used per acre.	This is not apparent anywhere yet. The same plot, cultivated with wheat for four years running, is said, however, to produce only half the quantity that might be expected unless heavily manured.
Unirrigated . .	Apparently not .	As above	In Rohtak 10 to 15 maunds per acre. In Sampla 10 to 12 maunds. In Jhajjar 6¼ maunds with 38 seers of seed per acre. In Gohana 10 maunds with 43 seers of seed.	As above.
As above . .	As above . .	Ditto	14 maunds per acre (seed 38 seers per acre).	Ditto.
Valuation Report,	the particulars of	which are as follows:—		
As above . .	As above . .	As above	Average 12 to 15 maunds in Rohtak, and 15 maunds in Sampla, per acre; seed 38 to 40 seers per acre.	Ditto.

Statement of Wheat Cultivation

[ABBREVIATIONS.—SW *Soft White*; HW *Hard*

1	2			3	4	5
District.	Number and Description of Specimen.			Is it commonly grown in the district or confined to a special locality?	Nature of soil on which grown.	System of cultivation.
	Value No.	Colour and hardness.	Name.			
Rohtak—*continued.*			Lal gehun (soft red wheat).	All over the district.	Grown on Rousli and Mattiar lands, canal or well-irrigated, or on Dabri (inundated) land.	As above on canal-irrigated lands. On *well-irrigated lands* in Rohtak and Sampla the land is ploughed once in July and nothing more done until October, when, if no rain has fallen, it is watered from wells. In Jhajjar and Gohana the land is first ploughed in September and rolled (the no process being called locally *bhadwar*). If rain falls in September, the land is watered by well. After this point the procedure is the same in all four tahsils. If, from failure of water in the well, or want of rain in October, the watering cannot take place that month, the soil is ploughed dry and watered from the well and again ploughed and sown in ploughing. This takes place up to end of October, the last process of sowing on land which has not had the usual first watering being termed *burhurya*. After sowing the land is watered every 15 days. The harvesting is the same as with other wheats.
Jullundur.	32	HW	Badának (beardless).	The extent of cultivation is insignificant. (This grain is used sometimes by natives for sweetmeats, but is generally cultivated for bread for Europeans. The straw is said to make bad fodder.	Not stated . .	The best time of sowing is from middle of October to middle of November, seed sown after that to middle of December gives a poor outturn. The crop ripens in the middle of April. The course of cultivation is as follows: The land is ploughed a couple of times in January and February; it is then manured, then re-ploughed and rolled as often as possible between setting-in of rains at end of June and seed time. Wheat under irrigation is watered 4 or 5 times. In irrigated lands the seed is sown by hand in furrows; in other cases with the *derk*.
			Lal (or red) mandi (or bald).	Principally cultivated.	Ditto . . .	Deputy Commissioner reports on these, though they are not mentioned in the list, of samples; cultivation as above. The red variety is principally cultivated, the extent of the others being very small.
Amritsar.	43	SW	Safed kanak. *N.B.*—(Deputy Commissioner reports on both red and white.)	Soft red and white wheat are raised in Amritsar.	(1) Gohra (near villages, highly manured and irrigated). (2) Maira (sand and clay equally mixed).	Six months before sowing, the land is ploughed from 5 to 10 times, according to cultivator's industry. After sowing, the crops are watered not less than 6 or more than 9 or 10 times. Irrigated lands are manured once in 2 years, but the unirrigated lands are not manured. When ripe.

in certain Districts of the Punjab,—continued.

White; SR *Soft Red;* HR *Hard Red.*]

6	7	8	9	10
Irrigated or unirrigated.	Manured or unmanured.	Has the land long been cultivated with wheat? What is the system as to fallows? Is the land do-fasli? and if so, what crop follows wheat?	Average produce.	Has the productive power of soil begun to fail?
As above .	As above . .	As above	Average in Rohtak and Sampla 15 to 20 maunds per acre; in Jhajjar 16 maunds (14 maunds if not manured); and in Gohana 12 maunds 38 seers of seed per acre.	As above
Irrigated . .	.....	There is no reason to suppose that the land has deteriorated from over-cropping. Except in highly manured lands wheat is grown year after year. The great extension of cultivation doubtless does not permit of so high a cultivation of a large area as of a small area, and reduction of pasture land diminishes manure supply, so that in ordinary irrigated soils there is probably a less actual yield than formerly; but as to other lands there appears to be no material difference, while the immense extension of irrigation has greatly enhanced the total outturn.	16 maunds per acre.	See column 8.
Both irrigated and unirrigated.	Manured and unmanured.	As above. (The remark above applies particularly to the Lal or red species.)	RED. *Mds.* / BALD. *Mds.* Unirrigated manured . 12 / 11 Irrigated . 14 / 13 Flooded by river 10 / 6 Rain land . 8 / 7	
Both. The best crops are raised in irrigated lands.	Irrigated lands manured.	The wheat crop is usually cultivated each year on the same land in which sown before. In do-fasli lands other grain is sown for the autumn crops.	13 maunds per acre	There are no statistics to show, but it is unquestionable that the finest crops are raised on lands newly brought under

Statement of Wheat Cultivation in certain

[ABBREVIATIONS.—SW *Soft White*; HW *Hard*

1	2			3	4	5
	NUMBER AND DESCRIPTION OF SPECIMEN.					
DISTRICT.	Value No.	Colour and hardness.	Name.	Is it commonly grown in the district or confined to a special locality?	Nature of soil on which grown.	System of cultivation.
AMRITSAR,—*continued.*					(3) Rohi (fine matured low land, a stiff loam).	the crop is cut down close to the ground, tied in bundles, placed in heaps on the threshing floor, when the grain is separated by being trampled out by cattle, and winnowed by being tossed in the air.
LAHORE.	69	SW	Daud khani .	Is a speciality of some 10 or 15 villages in the Kasur and Chunian parganas.	Maira Chahi (light sandy loam, irrigated by well).	The land is ploughed three times during the heavy rains in July and August. In October it is irrigated and ploughed twice, the grain being dropped in at last ploughing, through a tube attached to the plough handle. The land is then smoothed by a rough roller called "*sohaga*." After this the crop is irrigated once a month for three months, and periodically weeded, if the cultivator can afford this; manure is rarely used, never at any distance from the villages. The people say that there is something special in the soil that when good seed is obtained from Bagri and elsewhere it yields a good crop the first, and perhaps the second year, but afterwards deteriorates.
GUJRANWALA.			Daud khani .	Slightly cultivated in tahsils Gujranwala and Wazirabad, as it yields a smaller return than other wheat.	*N. B.*—Reports from Gujranwala and Ferozepore though not Dusai and well-irrigated land, though it can be cultivated upon rain-watered and sailaba land.	Not stated. The straw is much weaker than that of other kinds of wheat.
FEROZEPORE.			Not stated .	Not stated .	Kardar (hard clay) and Gasra (clay and sand).	After a good fall of rain the land is ploughed up 3 times in September and as often in October. After a fall of rain in October the land is again ploughed, levelled, and sown (about 32 seers of seed to the acre). If no rain falls after sowing, the land is irrigated 5 or 6 times where irrigation is available.
RAWALPINDI.	108	SR	Gorni . .	Not stated .	The sample sent to England was grown on the manured lands in the higher portions of the Murree hills.	Not described . . . . .

Districts of the Punjab,—continued.

Whiite; SR *Soft Red*; HR *Hard Red*.]

6	7	8	9	10
Irrigated or unirrigated.	Manured or unmanured.	Has the land long been cultivated with wheat? What is the system as to fallows? Is the land do-fasli? and if so, what crop follows wheat.	Average produce.	Has the productive power of soil begun to fail?
				canal irrigation. The soil cannot return the same yield year after year without some restorative. The number of cattle has diminished greatly in canal districts, and the want of manure must soon make itself felt seriously.
Irrigated. It is stated that canal-irrigated lands, though they produce equal or greater quantities of grain, never yield so good a quality.	Manured. To a slight extent wheat lands are said to lose their productive power unless occasionally manured, but the people of village Bagri, whence the sample sent to England was obtained, never manure their lands.	The land has been under wheat 20 years and shows no signs of deterioration.	8 to 10 maunds per acre.	
called for, have been	submitted and are a	bstracted below.		
Both . . .	Both . . .	Not stated	About 6½ maunds per acre.	Not stated.
Both apparently .	Manured to a very small extent. Best grain raised on manured lands.	The land is cultivated every winter with wheat crops and never left fallow.	9 maunds per acre.	Nowhere has the productive power of lands under wheat shown symptoms of deterioration.
Unirrigated . .	Manured . .	The length of time for which the land has been sown with wheat is not stated. As a rule, two crops are grown in the year—maize and wheat; maize is invariably sown, and is followed by wheat, if after the crop is cut there is sufficient moisture in the ground to cause germination. Manured lands in the hills grow two crops every year.	The average produce per acre is in tahsil Murree— (1) On manured lands 10 mds. (2) On unmanured lands 7 mds.	Not stated.

Statement of Wheat Cultivation

[ABBREVIATIONS.—SW *Soft White*; HW *Hard*

1	2			3	4	5
DISTRICT.	NUMBER AND DESCRIPTION OF SPECIMEN.			Is it commonly grown in the district or confined to a special locality?	Nature of soil on which grown.	System of cultivation.
	Value No.	Colour and hardness.	Name.			
RAWALPINDI—*continued.*	109	HW	Sufed . .	Not stated .	The sample sent was from Fatteh-jang. This wheat is grown on every kind of soil throughout the tahsil.	Not described.
	110	WS	Rodi sufed .	Not stated .	The sample was sent from Murree lower down than sample No. 108, near the Jhelum river or the plains.	It is grown similarly to the other wheat on manured lands, and on alluvial patches alongside the Jhelum.
GUJRAT.	82	HR	Nikki . .	Ditto . .	Barani or Maira land.	The land is broken up and constantly ploughed for one year, after which the seed is sown either broadcast or in furrows. When the young wheat comes up late in December or early in January the fields are weeded.
					N.B.—Deputy	Commissioner was only required to report in
	84	SW	Dagar . .	Not stated .	Cultivated on lands close to villages, but there is a change in the crops sown every half year.	Land is broken up and ploughed many times between May and September. About the time of the last sowing the land is manured; it is then ploughed up again and levelled. The seed is then sown either broadcast or in furrows. When the young corn has come up about 6 inches it is weeded and watered, and thenceforward it is watered every 20 or 25 days.
	83	HR	Jowalla . .	Ditto . .	Do-sala Sailaba land on river banks.	As in sample No. 82 above.
JHANG.	121	HR	Batti shorkot-wala.	Not stated .	I. In the Hithar or riverain lands wheat is sown on— (*a*) Dar, first class alluvial land. (*b*) Ghassar, 2nd class alluvial land. II. In Utar or highlands on— (*a*) Chahi or well-irrigated, and (*b*) Nasheb or land in a natural fallow in which water rests.	(Deputy Commissioner's description is general, and does not apply to samples named.) In *Hithar* lands the land is ploughed up four times, and the seed sown by drill. In *Utar* lands, *chahi* land is watered before being ploughed, and the seed is sown broadcast; and in *Nasheb* lands it is not previously watered. *Dar* and *Ghassar* are the best lands. *Dar* does not need manure, its richness being derived from river silt. *Chahi* lands are manured if the owner is rich enough; *Nasheb* lands are not. *Hithar* lands need two waterings to ripen the crop; *Utar* lands 7 or 8.

in certain Districts of the Punjab,—continued.

White; SR *Soft Red;* HR *Hard Red.*]

6	7	8	9	10
Irrigated or unirrigated.	Manured or unmanured.	Has the land long been cultivated with wheat? What is the system as to fallows? Is the land do-fasli? and if so, what crop follows wheat?	Average produce.	Has the productive power of soil begun to fail?
Both . . .	Both . . .	Manured lands bear two crops, as in Murree; the second crop in Fattehjang being bajra. Irrigated lands are generally manured, and manured rain-lands are cultivated on the do-fasli-dosala system. The land bears bajra, followed by wheat, and lies fallow till the next harvest, during which it is frequently ploughed. Rich alluvial deposits are cropped with wheat every year.	In Tahsil Fatteh-jang— (1) In land irrigated by well, 12 to 14 mds. (2) Irrigated by floods, 9 mds. (3) Rain land, manured, 10 mds. (4) Ditto. Unmanured land, 8 mds., but the average fluctuates, and land that in a bad season gives only 5 mds. may in a good season yield 12 mds.	
Not	stated.	Not stated.		
Unirrigated . .	Unmanured . .	No information . . .	12 maunds per acre.	
regard to above spe	cimen, but he has	also reported on two others as	follows:—	
Irrigated . .	Manured . .	No information . . .	18 to 20 maunds per acre.	
Unirrigated . .		No information . . .	10 maunds per acre.	
See	column 5	*Dar* lands grow magnificent wheat crops year after year. *Ghassar* lands grow three crops of wheat, and then for a year or more, accordingly to more or less exhaustion of soil, inferior crops are sown. *Utar* lands are usually cropped with wheat one year, and some other grain the next. But half the land attached to each well lies fallow one year, and the other half next. *Nasheb* lands from their dependence on scanty rainfall must often lie fallow.	The best manured *Chahi* is about equal in productive power to *Dar*, and the average crop from such lands is about 16 maunds.	There is no evidence to show that the productive power of the land has begun to fail; on the contrary, there is every reason to believe it is as good as ever.

Statement of Wheat Cultivation in certain

[ABBREVIATIONS.—SW *Soft White*; HW *Hard*

1	2			3	4	5
District.	No. and Description of Specimen.			Is it commonly grown in the district or confined to a special locality?	Nature of soil on which grown.	System of cultivation.
	Value No.	Colour and hardness.	Name.			
Muzaffargarh.	113	HW	Mendhianwala	This wheat is grown in small quantities.	The soil of the district is wholly alluvial, and consists of good clay, on the surface, with substratum of sand. Soils are prized according to the thickness of clay. This wheat is sown on any kind of clay except that which is sandy.	The land is manured and ploughed 3 to 5 times. The crop is generally irrigated from wells, but sometimes by subsoil percolation.
	117	SW	Valelan . .	Ditto . .	In soil which is not sandy.	As above, except that there are 4 ploughings
Montgomery.	139		Lal gehun (?)	Not stated .	Sikand (clay soil). Gasra (loamy soil). Gora Chahi. The best wheat is raised on sailaba lands.	*On Chachi and Jhalari (well-irrigated) lands.*—During the rains in June or July the land is ploughed two or three times and smoothed. If rain has been plentiful and the ground remains moist, seed is sown broadcast in October, November, and December. The ground is then again ploughed and smoothed, and the beds formed. If there is subsequent rain, the fields are irrigated from wells or jhalars 6 or 7 times; if there is no rain, 9 or 10 times. If there is little rain or no rain during the rainy season, or if the land does not remain moist up to October, it is irrigated before the seed is sown. When the seed is sown in October a good crop is returned; if in November about 25 per cent. less than if sown in October; and if sown in December about 30 per cent less. *On Sailaba lands.*—At the last inundation during the rains (generally in August) the land is ploughed two or three times and smoothed. In October seed is sown through a nâli nâl or drill; no beds are formed, and no subsequent irrigation takes place, as the crop depends on rainfall. *On Kasht barani lands.*—The mode of cultivation as in Sailaba lands. The crops on this land depend entirely on good rainfall.
						(Deputy Commissioner reports generally on wheat culti
Dera Ghazi Khan.	159	SW	Sufed . .	...	The best classes of wheat are grown in "Milk" and "Glas" soils, which are argillaceous and contain a small percentage of lime.	Ploughing commences in August; three good ploughings are given; after each the land is levelled. Sowings take place from 15th October to end of November, but the best crops are obtained from early sowing. The best crops are raised on irrigated and manured land, but, as a rule, manuring is but little resorted to, except near the sadr station, where land is highly manured so as to force it. Wheat is largely grown on low-lying alluvial lands on river margin, which retain sufficient moisture with the aid of a shower or two to ripen the crop without artificial irrigation.
	161	HW	Do. . .			

Districts of the Punjab,—continued.

White; SR *Soft Red*; HR *Hard Red*.]

6	7	8	9	1
Irrigated or unirrigated.	Manured or unmanured.	Has the land long been cultivated with wheat? What is the system as to fallows? Is the land do-fasli? and if so, what crop follows wheat.	Average produce.	Has the productive power of soil begun to fail.
Irrigated . .	Manured . .	This wheat is grown in land which has long been cultivated with wheat, and also in newly reclaimed land, without any difference in outturn.	656 to 820 lbs. per acre, 8 maunds 10 seers.	Nothing to show that the soil is deteriorating.
Ditto . . .	Ditto . . .	This wheat is grown in land which has been long cultivated with wheat.	820 lbs. per acre, 10 maunds.	Ditto.
Irrigated . .	Manured 3 times for each crop, *viz.*, in September, December, and January, in the proportion of 160 donkey-loads per acre.	Chahi and Jhulari lands are cultivated with wheat every year.	Average produce per acre on Gora Chahi 10 maunds 25 seers; on Gasra 10 maunds 35 seers; on Sikind 9 maunds.	The productive power of irrigated land does not fail, as manure is freely used.
Not irrigated .	Not manured .	Sailaba and Barani lands are cultivated for about 4 or 5 years, when the yield deteriorates both in quantity and quality. The land is then left fallow for a year or two, when it regains its productive power.	Average produce per acre— *On irrigated lands—* *I. River.* (*a*) Gasra (loam), 9½ mds. (*b*) Sikind (clay), 10 mds. 33 seers. *II. Canal.* (*a*) Gasra, 13 mds. (*b*) Sikand, 10 „ *On unirrigated lands—* (*a*) Gasra, 6 mds. 35 seers. (*b*) Sikand, 6 mds.	

vation without reference to the particular specimens named.)

oth . . .	Both . . .	Rotation of crops is carefully observed; where indigo is sown the rotation of wheat comes every fourth year. Where cotton, jowar and bajra are sown, the rotation on an average is every third year for wheat. Although on very good soil, wheat is grown every 2nd year with cotton, yet this rapid rotation in the end ruins the lands, and when the zemindars see land losing vitality they allow it to lie fallow.	On good manured soil from 17 to 25 maunds. On average soil both irrigated from wells and unirrigated, but within the influence of the river, from 10 to 15 maunds. On poor land 4½ maunds per acre.	Not yet, although a great deal of land does give a small yield.

Statement of Wheat Cultivation in certain

[ABBREVIATIONS.—SW *Soft White*; HW *Hard*

1	2			3	4	5
DISTRICT.	No. and Description of Specimen.			Is it commonly grown in the district or confined to a special locality?	Nature of soil on which grown.	System of cultivation.
	Value No.	Colour and hardness.	Name.			
BANNU.	130	SR	Marwati .	Not stated .	The sample sent to England was raised in Marwat, the soil of which is mostly of a light sandy description.	Not stated . . . . .
				The Deputy Co	mmissioner's report	relates to the growing of wheat in general in
HAZARA.	136	SR.	Moti .	Not mentioned	Not stated . .	Sowings finish about 28th November, and crops are ready about 11th of following June.
	NOTE.—Deputy Commissioner is not certain which of the samples he sent to England corresponds with No. 136 SR. He mentions the following descriptions of wheat grown in his district, samples of which are sent home. White wheat, *Dug* and *Moti*, from Anaitabad and Buffa in Pukhli, Mansehra, which apparently correspond with Nos 137 and 138 of the list; Red wheat (*Lal*) from Anaitabad and Buffa of Pukhli and Jagal and Bhear in Haripur; this Deputy Commissioner identifies with No. 135. Red, mixed with white (*Moti*), was sent from Abbottabad and must be sample No. 138.					
		SW.	Dug and Moti .	Not stated .	Not stated . .	Sown about 20th September and gathered about 1st June.
	135	SR.	Lal . .	Not stated .	Not stated . .	As in No 137 above in Anaitabad and Buffa. In Haripur tahsil it is treated in the same way, except that no kharif crop is taken.
KOHAT.	99		Kalanji .	Mostly grown in Kohat tahsil. In the Hangu tahsil soft white wheat (Tirahi) is sown; and in Khattak a quickly ripening red wheat.	On rich well-manured soils generally irrigated. The land on which grown is also used for rice, which improves it for wheat.	Not stated . . . . .

FINANCIAL COMMISSIONER'S OFFICE,
The 4th April 1883.

Districts of the Punjab,—continued.

White; SR *Soft Red*; HR *Hard Red*.]

6	7	8		10
Irrigated or unirrigated.	Manured or unmanured.	Has the land long been cultivated with wheat? What is the system as to fallows? Is the land do-fasli? and if so, what crop follows wheat?	Average produce.	Has the productive power of soil begun to fail.
Unirrigated ...	Unmanured ..	In some lands wheat is sown year after year without change, but in others it is sown by rotation.	Soils of middling quality yield from 3½ to 3¾ maunds. The best qualities produce 5 or 5½ maunds; with irrigation and manure the outturn reached 6½ maunds.	
the Marwat pargana	h, as he has been un	able to identify the sample sent	home to England.	
Both. If too much manure is used and the land is well watered, the wheat grows to a great height and falls of its own weight. If largely manured without water, the manure destroys the crop.	Both.	If the land is rich, a kharif crop is taken between June and October; but, as a rule, the land is allowed to lie fallow during that period.	Average produce per acre on irrigated and manured is 640lbs.=8 maunds; irrigated but unmanured 400 lbs. = 5 maunds; unirrigated and manured 400 lbs. = 5 maunds; unirrigated and unmanured 240 lbs. =3 maunds.	It cannot be said with certainty whether land has deteriorated; but, as zemindars have only lately commenced to manure their lands and much is still unmanured, it may be assumed that there has been no deterioration.
Unirrigated . .	Unmanured . .	The land is allowed to remain fallow after each year's wheat crop until the next is raised, but every third or fourth year a kharif crop is taken between June and August.	About 800 lbs. per acre = 10 maunds.	Ditto.
Ditto . .	Ditto . .	...	In Mansehra tahsil 800 lbs per acre = 10 maunds. In Haripur 480 lbs. =6 maunds.	Ditto.
Both . . .	Both . . .	Owing to the use of manure, some land can be cultivated with wheat every year; when manure is not used, fallows have to be occasionally allowed.	20 maunds an acre is a good yield, 30 maunds exceptional Allowing for failure of irrigation and calamity of season, the average may be put at 10 maunds.	

R. G. THOMSON,

Junior Secretary to Financial Commissioner, Punjab.

No. 3751-210, dated Nagpur, the 2nd October 1882.

From—J. B. FULLER, Esq., Offg. Junior Secretary to the Chief Commissioner and Director of Agriculture, Central Provinces,

To—The Secretary to the Government of India, Department of Revenue and Agriculture.

I AM directed to submit the report on wheat cultivation in these provinces which is called for in your endorsement No. 7—153-165, dated 14th May 1881. The points to which attention was carefully invited are noted on the margin, and I am to observe at the outset that, with the exception of the last one, these points received notice in the report on wheat cultivation which was submitted with this Administration's No. 3747-177, dated 28th September 1877. All that is now required appears, therefore, to be a report in most part merely supplementary of what has been briefly written, but the opportunity has been taken of going briefly over the ground already covered so as to render the present report a tolerably complete account of the conditions under which wheat is grown in these provinces, and of the position which it occupies in the agriculture of the country.

The nature of the soils on which the better classes of wheat are grown.

The system of cultivation followed.

The use of manure or irrigation.

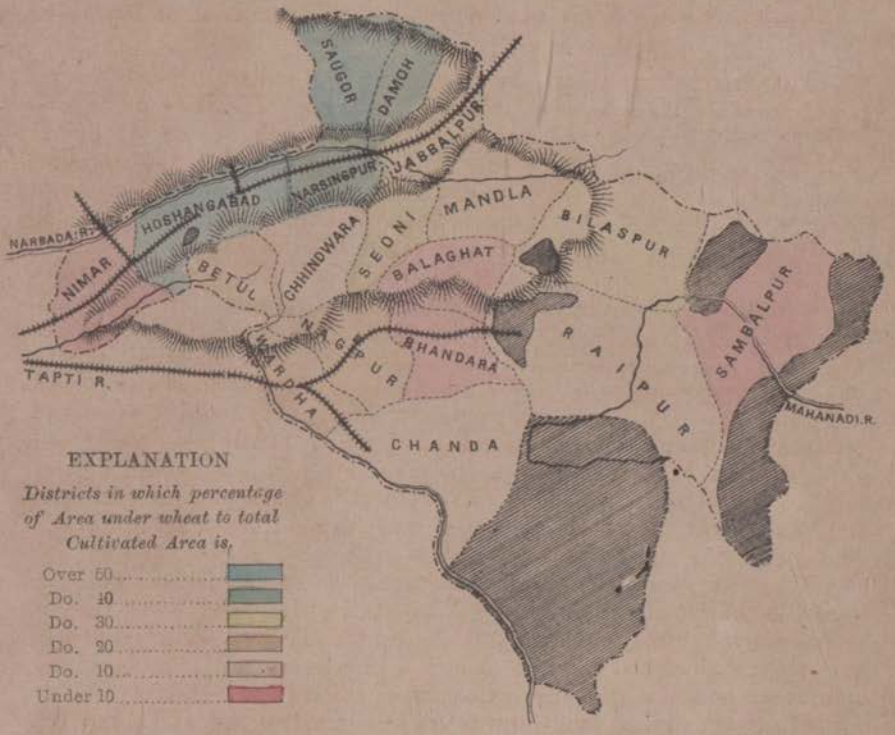
The average weight of outturn per acre.

The length of time during which land has been cropped with wheat, and any deterioration in its productive power which may have become apparent.

2. The area under wheat cultivation as recorded during the last years of settlement (1866–68) was close upon 3,314,000 acres. The area shown in the returns for the year ending March 31st, 1882, was 4,180,000 acres, indicating an increase of 26 per cent. in the fourteen years which have elapsed since settlement. And this is believed to be rather under, than over, the real mark, since extension of cultivation is the fact respecting which the annual land returns are least trustworthy, and this is precisely the fact in issue here. Indeed, judging from the returns, wheat cultivation remained almost stationary until 1881-82, when it advanced at a bound from 3,391,000 to 4,180,000 acres. The average for the four years preceding 1881-82 was only 3,280,000 acres. But this sudden advance in all probability merely indicates an improvement in the accuracy of the land returns to which the attention of district officers has been specially directed since 1880, and which have been subjected to a far more thorough supervision and testing during the last two years than at any previous period.

3. The distribution of wheat cultivation throughout the provinces, is roughly shown in the subjoined sketch map in which districts are variously coloured according to the proportion which their wheat area bears to their total area under cultivation.

Wheat cultivation reaches, therefore, its greatest importance in the northernmost districts and in the districts of the Nerbudda valley, after which it is most extensive in the Satpura hill region and the Wardha and Nagpur districts to the south-west of it. The insignificance of the area under wheat in Nimar is due, as will be pointed out further on, to be a a peculiarity in its soil, which is not deep enough to grow cold-weather crops without irrigation. The cultivation of Bhandara, Balaghat, and Sambalpur is almost wholly engrossed by rice.



EXPLANATION

Districts in which percentage of Area under wheat to total Cultivated Area is,

Over 50
Do. 40
Do. 30
Do. 20
Do. 10
Under 10

4. Although these provinces are entitled to rank with the North-West Provinces or the Punjab in respect to their wheat production, yet the conditions under which wheat is grown here are widely different to those of the two latter tracts. Manure and irrigation—all-important in Upper India—play but an insignificant part here. The thinness of population, and consequent large extent of individual holdings, offers more inducement to low farming on a large, than to high farming on a small, scale. The outturn of the land is actually far smaller than in more crowded tracts, whilst the surplus produce per head is considerably larger, since the poorer the cultivation, the larger is that proportion of the produce which results from natural forces as opposed to the labour of the cultivator. It is doubtful, indeed, whether wheat cultivation in these provinces is susceptible of the elaboration which characterises it in Upper India. The soil on which most of the Central Provinces' wheat is grown is the heavy black loam, known *par excellence* as "cotton soil" which is prominently characterised by its stubbornness under opposite extremes of damp and dryness. When soaked with rain, it becomes a sticky unworkable morass; and when dry, rapidly becomes of great hardness, splitting up into numerous dry fissures, which swallow up any water applied to the surface, and enormously increase the cost of irrigation.

5. This black or "cotton" soil is known by various names indicating the proportion in which it is mixed with lighter soil. It is of very variable depth, lying in much thicker deposits in flat valleys than on sloping ground. Thus, in the Narsinghpur and Hoshangabad districts of the Nerbudda valley, its average thickness is at least 10 feet, whilst amongst the hills and slopes of the Nimar district it frequently occurs as a scanty coating of a few inches. It is most suitable for wheat when at its greatest thickness, since, from the great capacity which it then enjoys of absorbing rain water, it can, in a monsoon of average intensity, lay up a store of moisture sufficient to carry a wheat crop through a cold season in which the winter rains hold off entirely. When it is merely a shallow veneer of earth, covering rocks, it dries, of course, with far greater rapidity, and is in this case devoted to the production of rain (or *kharif*) crops. This difference is brought out into strong relief by a comparison of the agricultural returns for the contiguous districts of Hoshangabad and Nimar. In Hoshangabad deep black soil predominates, and, in consequence, 63 per cent. of its cultivated area is returned as under wheat. The greater portion of the Nimar district is hilly or undulating ground, consisting of trap rock, overlaid with a shallow bed of black soil. Wheat only occupies 4 per cent. of its cultivated area.

6. There is some difference of opinion as to the origin of this black soil. One theory ascribes it to the disintegration of trap rock or basalt, and another to the action of lacustrine deposit. The dark colour is in the first case accounted for by the black colour of the trap from which it is derived, and in the second case assigned to the presence of a large proportion of organic matter, which is, however, not always borne out by analysis. Black soil is characteristic of South and Central India, and the wide distribution of trap is one of the most striking features in the geology of this tract. The only places where it occurs in Upper India are Bundelcund in the North-West Provinces, and Rajmahal in Bengal, both of which are covered by drainage from basaltic hills. There can be

no doubt that in certain cases black soil is disintegrated trap, since the process of disintegration can be traced *in situ*, and it will be probably safe to assert that it in any case owes some of its most characteristic features to an admixture of decomposed basalt, although its colour may, to some extent, be due to the method in which it was deposited in its present sites.

7. The alteration of rabi and kharif crops is not so common in these provinces as in Upper India, since the soils are of more marked diversity, and are, therefore, more strictly appropriated, some to autumn and others to cold-weather crops. The deep wheat land of the Nerbudda valley is reported to be almost unworkable in the rainy months, while shallow soils, with a substratum of rock, dry too quickly to be suitable for rabi crops. For ordinary wheat cultivation, operations commence in April or May, when the surface of the ground is scarified with a hoe-plough known as the *bakkar*. After the setting-in of the monsoon the surface is again scarified, once in July and once in August, if, as is hoped, there is long enough break in the rains to allow the ground to become sufficiently dry to bear the plough cattle. A fourth hoeing—the most necessary of all—is given in September towards the end of the rains, the importance of which arises from the fact that loss of moisture by evaporation is much checked if the surface of the ground be in loose condition. A final hoeing is given at the beginning of October, after which the field is ready for sowing. This represents the preparation which a careful cultivator will give his land under favourable circumstances, and, as a rule, land seldom receives more than two or three hoeings before it is sown. The seed is occasionally sown broadcast and ploughed in, but is more generally drilled in, the implement used for the purpose being an ordinary native plough, or more properly "grubber," fitted with a bamboo tube alongside of the stilt, down which the seed is dropped. From 80 to 120 lbs. of seed are sown to the acre, less being used when the soil is moist, and there is no fear of the seeds refusing to germinate, than when the soil is in dry condition. Weeding appears to be seldom if ever given, and the crop is left entirely to itself until harvest comes with the beginning of March.

8. An entirely different system of cultivation is followed in a tract of country which includes a considerable portion of the Jubbulpore and a small portion of the Narsinghpur and Seoni districts. The fields are surrounded with banks so as to prevent all surface drainage, and the rain water is allowed to accumulate in them, converting them into tolerably deep ponds during the rainy months. The water is let off at the beginning of October, and wheat is then drilled into the ground without any preliminary ploughing or preparation whatever. Occasionally some rice is sown broadcast in the field when flooded, and is ready for cutting before the wheat is sown. But this rice crop, if taken at all, is generally a very small one, and the real object in embanking the land is to allow the soil to get saturated with water to as great a depth as possible, and increase the store of moisture which capillary attraction is to keep within the reach of the wheat crops during the dry cold-weather months. The process, therefore, corresponds in some sort to irrigation. It is reported to increase the outturn of wheat by at least 25 per cent., and to be of much service in clearing land infested with *kans* grass and

other weeds. The principal reason why it has not spread over a wider area lies probably in the necessity for co-operation between one cultivator and another, since the system is believed to succeed only when practised on a block of contiguous fields which mutually assist one another to withstand the rush of surface drainage and the pressure of the water on the confining banks—causes which have hitherto ruined experiments tried with isolated fields.

9. In regard to the use of manure, there appears considerable diversity of practice in different parts of the provinces. Thus manure is reported to be hardly ever applied to land in the Nerbudda valley, while in Nimar and in the districts of the Nagpur Division its utility is fully recognised, each wheat-field receiving a manuring, if possible, once in three years. The explanation may lie in the greater effectiveness of manure on shallow than on deep soils. On the former it makes all the difference between a fair crop and no crop at all, while on the latter it would merely add in some degree to a fertility which is as yet very far from being exhausted.

10. The scanty use of irrigation has been already noticed. It is almost entirely confined to sugarcane and garden crops, and is rarely, if ever, applied to wheat, since if the rainfall is at all propitious the harvest yields a sufficiently large surplus to satisfy the cultivator. The most favourable distribution of rainfall possible would be a heavy fall of 8 or 10 inches between the middle of June and the third week in July: then a break of a fortnight to allow of ploughing, followed by a second fall of 5 or 6 inches in August. September should open with a week or 10 days of fair weather followed by a heavy downpour lasting on into the beginning of October. Under these circumstances a fair crop would be reaped in the absence of all rain between sowing and harvest time, but there should be a fall of 2 or 3 inches during the cold weather, which would greatly add to the outturn if protracted damp weather does not develop the fungoid diseases of rust or smut. It is impossible, however, to say whether, with a greater press of population, irrigation may not be gradually extended to wheat. Experiments on the Nagpur Model Farm have shown conclusively that two waterings add very greatly to the outturn, but it is very doubtful whether the crops can ever stand the cost of irrigation if wells are the only source available.

11. The average produce per acre for the provinces was, in the report previously submitted, set at 640 lbs., or 10⅔ bushels. In the Review of the Provincial Reports, a copy of which was forwarded to this Administration with Government of India's No. 8—406-17, dated 20th October 1879, this estimate was quoted as too high a one, and an opinion was given that on the figures shown in the report an all-round average of 480 lbs. to the acre would not seem below the mark. The only tract for which new information has been collected on this point is the Nerbudda valley, for which Mr. Nicholls, the Deputy Commissioner of Narsinghpur, has, after careful enquiry, framed an average outturn of 6 mds. (= 480 lbs. nearly) to the acre, or to four-fold the seed sown—an estimate which exactly agrees with that following from the figures already reported.

12. In regard to the much-vexed question of the exhaustion of the soil by continuous cropping, it will be impossible to do better than quote

the conclusions to which Messrs. C. A. Elliott and C. Grant arrived, after careful enquiry, when settling respectively the Hoshangabad and Narsinghpur districts. There appears no room for doubt that the black soil of the Nerbudda valley yielded a far larger return when first broken up than it does now. Tradition points to a rate of produce in the golden age—at the commencement of this century—which seems to have been as much as ten- or twelve-fold the seed sown; that is to say, 15 to 18 maunds to the acre. This is corroborated by recent experience of newly-broken land in the Tapti valley, an almost precisely similar tract, of which Mr. Elliott wrote that "the wheat stands breast-high in some of the new villages, and the ear is very large and full; the crop is nearly double the average of the Nerbudda valley." He estimated the average outturn in those villages at 12 maunds (=16 bushels) to the acre. The outturn appears to have fallen off very rapidly at first, and the deterioration was very apparent in 1844, and receives considerable attention in Colonel Sleeman's writings. It was in full progress during his time, but the decline seems now to have reached a point below which it does not continue. Mr. Elliott's enquiries led him to believe that the outturn fell very rapidly from 12 maunds to 8, and then rather slowly to 6 or 7. Mr. Grant expresses a similar opinion in the following paragraph:—

"Mr. Maloney and Captain Sleeman, who are the only authorities regarding the early condition of the valley, naturally attached great importance to the deterioration of the soil, for it was going on and that rapidly before their very eyes. All subsequent writers on the affairs of the district seem to have followed blindly in their footsteps, and it is almost a *reductio ad absurdum* of an undoubtedly true theory to find one of the district officers writing in or about 1830, that the returns had then sunk in places to two- or three-fold, and that ruin was hanging over the cultivating classes. The re-assuring feature in the otherwise disquieting decline of fertility in the soil is that the deterioration has not been gradually progressive, but that, commencing with a very considerable impetus, it has now become almost stationary. It will have been seen from the figures given above that while 20 years' cultivation reduced the returns from twenty-fold to six- or seven-fold, it has taken nearly double that time (from 1838 to 1866) to reduce them from five-fold to four-fold. And the present rate of diminution is so minute as to be imperceptible. Therefore, for all practical purposes, it may be assumed that the rates of produce will remain constant at the present point, even if improved modes of cultivation are not introduced in the course of the present settlement."

13. A notice of the wheat of these provinces would be imperfect if it contained no reference to the effect which the extension of railway communication has exerted upon it. The branch line of rail which now runs down the Nerbudda valley was not fully opened at the period during which the districts of that tract were under settlement, and it is interesting to compare the anticipated effect of the completion of line with the effort which it has actually exerted. Mr. C. Grant, then Settlement Officer of the Narsinghpur district, wrote in 1864 that, had the railway been open, he would have taken Rs. 2 per maund as the normal price of wheat, but, as the railway would not be open for three years or more, he took Re. 1-8-0 as his rate. He noticed that, when the railway was once opened, the price would never permanently sink below Rs. 2 a maund. The average price of the last five years has been Rs. 2-7-9 for the class of wheat to which these remarks applied. During the year ending March 31st, 1881, no less than 40 lakhs of maunds of wheat were despatched from railway stations in the Central Provinces. This represents the

outturn of about 7,00,000 acres, equal to the total area under wheat in the Narsinghpur, Wardha, and Nagpur districts. The secret of this large export lies, not so much in the productive power of the soil as in the scarcity of the population which derives its food from it. In the North-West Provinces no district out of Bundelcund maintains less than 700 persons to the cultivated square mile, and in many districts the number is between 900 and 1,000; in these provinces the maximum number is 616 (in the rice district of Sambalpur), while the provincial average is no more than 414.

14. The influence of commerce may be also seen in the *classes* of wheat which are grown. It is well known that natives prefer for ordinary consumption the hard glutinous varieties to the soft white varieties, which are principally in demand for the English market. Before the commencement of the annual drain of wheat to Bombay, soft wheat of the kind known as *pissi* was held in very low estimation, and commanded a price which ruled from 8 to 10 per cent. lower than that of the hard, *kathia* variety. Now its price is at least 12 per cent. higher than that of *kathia*. In old days it was no uncommon stipulation of a ploughman contracting for service that he should not have to eat *pissi* wheat more than twice a week. Now a ploughman who demanded it twice would certainly not receive it. *Pissi* wheat is grown on lighter land than *kathia*, and it is reported from both Saugor and Narsinghpur that the value of light land has risen in considerably larger proportion than that of heavy land, in consequence of the request in which *pissi* wheat now stands for the Bombay market.

It is probable, therefore, that the outturn at present gathered from land which has long been under cultivation may be considered as stationary for a very long period of years. The available food substances which were found stored in the soil when it was first broken up have now been exhausted, and the crop depends for its support on the stock of nutriment which the soil acquires each year by absorption from the atmosphere, as well as by the regular process of disintegration which is at work within itself. Experience has yielded exactly similar results in America, where the produce of freshly-broken land has been found to decrease very rapidly during the first few years of cultivation, and then retrogress with shorter and shorter steps until a point is reached at which it becomes fixed, or below which the decrease is so small as to be almost imperceptible. And a further corroboration, if one be needed, is furnished by the results of certain experiments conducted by Messrs. Lewes and Gilbert at Rothemsted which point to an exactly similar conclusion.

No. 2, dated Mount Abu, the 6th January 1882.

From—Colonel C. M. Walter, Officiating Chief Commissioner, Ajmir,

To—The Secretary to the Government of India, Revenue and Agricultural Department.

In reply to Resolution of the Home, Revenue, and Agricultural Department, No. 7—153-165, dated 14th May 1881, I have the honour to submit copy of a letter from the Commissioner of Ajmir, reporting on the quality of wheat grown in the Ajmir-Merwara District.

2. Any further or more accurate information that it may be possible to collect after the cold-weather crop has been cut will be duly communicated to you, as directed in your No. 347, dated 16th November 1881.

No. 1219G., dated the 7th December 1881.

From—The Commissioner of Ajmir-Merwara,

To—The Chief Commissioner of Ajmir-Merwara.

I HAVE the honour to submit the following report on the wheat grown in Ajmir and Merwara called for in your office No. 428, dated 29th June 1881, and to state that three samples from each district have been transmitted direct to the India Office.

2. The particular information asked for in Her Majesty's Secretary of State's despatch No. 30, dated 17th February last, is, 1st, as to the nature of the soil in which the better classes are grown; and, 2nd, the system of cultivation followed. With regard to soil, the native invariably selects the best land he has for his wheat crop, generally in the neighbourhood of a tank or well, from which it may be irrigated.

3. It is more of the nature of a sandy soil than a loamy one, with varying proportions of sand, frequently small quantities of lime, but no vegetable matter. The stiff soil in which wheat is grown in England is unknown here.

4. To obtain a full crop, the land is fallowed during the rainy season (June to September); during this period it is ploughed two or three times a month with the native plough to a depth of about 4 inches. At the close of the rains a heavy plank is drawn over the field, which serves the purpose of a roller, pulverises the surface, and prevents the moisture escaping. Whenever available, the dry beds of "nullas" (wide ditches) and artificial bunds are also sown with wheat, which produce fair crops without manure or irrigation.

5. Wheat is also occasionally sown on outlying fields without manure, and where no irrigation is available on such land the crop is not more than 7 bushels per acre, while on the best land with manure and irrigation the outturn is as high as 34 bushels. The average crop from such land is probably 25 bushels per acre.

6. A comparison between manured fields without irrigation and manured plots with irrigation cannot be made, as the conditions do not exist. In Rajputana the land is not manured for wheat unless irrigation is also available, as the crop would be entirely burnt up and would produce no outturn.

7. The quantity of manure applied is from 5 to 8 tons per acre, of a very poor quality. Dry mud from the bottoms of artificial tanks is also used for this purpose.

8. The sowing season begins about 25th October and lasts to the end of November, the crop being reaped early in April: the quantity sown is about 2 bushels per acre. The plan usually adopted is to fasten a hollow bamboo to the back of the plough, through which the seed is dropped by hand, the end of the tube following in the drill made by the plough.

If no winter rain falls, the crop is irrigated three or four times.

9. Wheat is occasionally sown on land from which a crop of fodder has been cut, but if this is done it allows a very short time for preparing the land.

10. Wheat is largely grown year after year from the same land, or only varied by an occasional crop of barley. The crop on being reaped is tied in sheaves and collected loosely in the neighbourhood of the village.

11. A threshing floor is then prepared by watering a circular plot of ground sufficiently large to allow of three or four bullocks walking round abreast. These are frequently driven over it while damp until the ground is firmly consolidated, and it is finally plastered by adding a small quantity of cowdung to the surface.

12. When sufficiently dry, the grain in the straw is scattered over the prepared floor and the bullocks driven over it until all the grain is trod out. The longest straw is taken out by means of a wooden fork and the chaff blown out by the wind, no artificial means being ever attempted for such separation.

The whole process is performed in a very slovenly way, the clean grain, such as it is, being shifted at each process on the bare ground, and in consequence it becomes mixed with a great deal of earth, small stones, and other foreign matter, which require the most perfect machinery to separate effectually from the grain.

It is generally during this process that what is intended as clean wheat becomes mixed with other grain, barley and grain being collected in close proximity.

More care and cleanliness is as much required in threshing as machinery for winnowing and screening afterwards.

13. The samples sent direct have all been passed through one of Corbett and Peele's winnowers, which has greatly improved their appearance.

14. Nos. 4 and 5 of the annexed Statement are probably the best of the samples, and would, no doubt, be further improved by carefully selecting the seed for a few years.

15. With regard to the mixing of different grains, wheat, as such, is kept separate as far as possible from other grain; any other grain which does get in is accidental, but in sowing barley the native mixes wheat with it for the purpose of getting an enhanced price for the produce.

Statement of Wheat grown in the Ajmir and Merwara Districts, Rajputana.

No.	Local name.	Where grown.	Cultivation.	Approximate yield per acre.	Price per 82 lbs	Village.
				lbs.	Rs. A. P.	
1	Katha	Merwara .	Irrigated and manured.	1,845	2 0 0	Neighbourhood of Todgarh.
2	Bajia .	Do. .	Do. .	2,062	1 13 6	
3	Do. .	Do. .	Do. .	2,062	2 0 0	
4	Do. .	Ajmir .	Do. .	1,845	2 5 0	Rampura. Sample very good.
5	Do. .	Do. .	Do. .	1,845	2 5 5	Kanhpura.
6	Katha	Do. .	Unknown .	Unknown .	2 0 0	Kekri. Mixed sample good.

No. 66, dated the 17th February 1883.

From—Major G. H. Trevor, Secretary for Berar to the Resident, Hyderabad,

To—The Secretary to the Government of India, Revenue and Agricultural Department.

With reference to your office letter No. 348 (Agriculture and Horticulture), dated the 16th November 1881, and subsequent reminder No. 68A., dated the 23rd ultimo, I am directed to submit, for the information of the Government of India, Letter No. 5284, dated the 18th October last, from the Commissioner, Hyderabad Assigned Districts, giving cover to a report by Mr. Dunlop, Assistant Commissioner in the Hyderabad Assigned Districts, on wheat cultivation in Berar, called for in Resolution of the late Home, Revenue, and Agricultural Department, No. 153—165, of the 14th of May 1881.

2. I am also to enclose for your information copies of two letters* addressed to the Commissioner, Hyderabad Assigned Districts, with reference to this subject.

* Nos. 356 and 357, dated 17th February 1883.

No. 5284, dated the 18th October 1882.

From—A. P. Howell, Esq., Commissioner, Hyderabad Assigned Districts,

To—The Secretary for Berar to the Resident, Hyderabad.

On receipt of your No. 1106 of the 30th May, and No. 2599 of the 19th November last, Mr. Dunlop was asked to draw up a brief memorandum with reference to paragraphs 2 and 3 of Secretary of State's despatch No. 30 of 17th February 1881, and I have now the honour to submit Mr. Dunlop's report on wheat cultivation in the Hyderabad Assigned Districts.

No. 202, dated Khamgaon, the 6th October 1882.

From—A. J. Dunlop, Esq., Assistant Commissioner, Khamgaon,

To—The Commissioner, Hyderabad Assigned Districts.

With reference to the correspondence received under your Endorsement No. 3111, dated 13th June 1881, I have the honour to submit the following information on wheat cultivation in the Hyderabad Assigned Districts.

2. Wheat in this province is a spring or cold-weather crop. It is sown in October and reaped in February. It is cultivated on the rich black soil of the Purna Valley, and on the loam that is found above the Southern Ghâts. Wheat is never cultivated on the lighter soils, which are only suited for autumn crops, such as cotton, jowari, &c. With the exception of stray patches of well irrigation, and some fields in the neighbourhood of tanks recently constructed or repaired, the wheat crop is not irrigated in this province, and I am unable at present to say whether a better *quality* of grain, *i.e.*, a grain which would make better flour, would be produced by irrigation. The *outturn* from irrigated land is, of course, greater, but the difference does not cover the extra cost of well irrigation. There are no* large irrigation works in the province.

* Of a total cultivated area in the province (under all crops) of 6,207,521 acres, only 45,282 acres are irrigated.

3. The wheat lands are manured in their turn with other fields according to the means of the cultivators. A poor cultivator works on year after year without manure, and his crops deteriorate. His richer neighbour keeps up the quality of his land by using such manure as he can procure without much trouble, and reaps the advantage. The native cultivators generally understand the value of manure. It is chiefly with them a question whether they can afford to store or to purchase it. The only kinds used are farm-yard manure and the ashes of jowari roots, &c.; and as cowdung is used as fuel for domestic purposes, very little remains for manure. Bones are not anywhere utilised, owing to the difficulty of preparing them. It is a pity to see so valuable a manure neglected, but, unless the question is taken up by Government, I see no likelihood of the cultivators moving in the matter. So little store do they set on bones at the present time, that an enterprising dealer has lately been able to collect a considerable quantity in the Akola District without any payment, and is now exporting them to Bombay for sale.

4. Wheat is cultivated in rotation with other crops. It is never sown in two consecutive years on the same land. The system of rotation varies according to circumstances, or the ideas of particular cultivators. A not uncommon rotation has hitherto been, 1st, wheat, 2nd, lac, 3rd, cotton, 4th, jowari, 5th, wheat. In other cases wheat is cultivated every second year, the intermediate crop being cotton or jowari; and if the demand for Europe continues, this practice is likely to become more common, to the exclusion of gram and other pulses, for which there is only a local demand.

5. We have still much to learn in respect to the average outturn of wheat per acre. Experiments, which are to be extended over a number of years, were commenced in 1880, and the results of two years have now been ascertained. For the first of these years, 1880-81, I received from your office only an abstract of the results of the experiment. This year I have been favoured with a perusal of the original statements received from Deputy Commissioners, the particulars of which, as regards wheat, are embodied in the statement appended to this letter.

Comparing the two series of experiments by districts, the result is as follows:—

	Average Outturn per Acre.				
	1880-81.			1881-82.	
	Mds.	Seers.		Mds.	Seers.
Akola District	3	22	...	5	19
Buldana do.	6	19	...	3	22
Basim do.	9	22	...	3	10
Amraoti do.	4	37	...	4	34
Ellichpur do.	5	20	...	6	3
Wun do.	8	22	...	not received.	
Average for the province . .	6	3	...	4	11

There is much in these figures which seems to require explanation. Taken as a whole, the crops of the two years under reference were full average crops. Nothing occurred, so far as I know, to damage or shorten the outturn in any district, and one would naturally, under these circumstances, expect to find some similarity in the results of the

various experiments. But, instead of this, the Basim District, which, in 1880-81, reported an average of 9 maunds 22 seers, now shows only 3 maunds 10 seers; the outturn in the Buldana District has also fallen from 6 maunds 19 seers to 3 maunds 22 seers, while in Akola, on the other hand, it has increased from 3 maunds 22 seers to 5 maunds 19 seers. Amraoti and Ellichpur are the only two districts in which there are no marked variations. It is, of course, quite possible, notwithstanding the extreme variations now noticed, that the experiments were correctly carried out, and that there were circumstances connected with certain fields which caused either an unusually large or an unusually small outturn. But the district reports are silent on the point. These reports practically give merely bare figures. In some cases the Munsarim's diaries have been attached, but they are simple records of the dates of inspection and harvesting, and do not afford the information which, next to the actual figures of outturn, is above all necessary, *viz.*, whether the crop was a full one, or whether it was affected by any local circumstances, such as attack by a flight of locusts, frost, unseasonable rain, and the like. In the absence of details on these heads, I am unable to account for the extreme variations either between districts or the two seasons referred to, and can only submit the figures as they have been received. For general purposes the average outturn of wheat may be estimated at about 5 maunds an acre. The result of fifty-three experiments made between the years 1869 and 1874 was an average outturn of 4 maunds 13 seers, and, I think, we cannot, with the present system of cultivation, or, I should rather say, so long as manure is scarce, calculate on more than about 5 maunds per acre.

6. In a previous report prepared in 1880 for the information of Government, I brought together all the information we then possessed regarding crop experiments in Berar, and pointed out how little practical advance had been made up to that period in the subject. Since then, rules for the carrying-out of annual experiments have been published in the Commissioner's Book Circular No. XVIII of 1881. These rules provide for—

(1) the permanent selection for experimental purposes of fields that fairly represent the average quality of soil in each taluka;
(2) the annual measurement of certain crops of each selected field;
(3) the submission of a report containing "a full agricultural history of each field" during the year, with the particulars of the rainfall at the nearest registering station from which the experimental fields are not more than 5 miles distant.

A careful collection of statistics on this basis, if subsequently classified and arranged in accordance with the circumstances of each experiment, would undoubtedly in the course of a few years afford information from which a reliable estimate of the crop-bearing properties of the soil could be formed.

The records of the past year do not, however, contain the "agricultural history of each experiment," which is essential for the proper classification of results, and the returns have in consequence lost much of their value. This point, which is noticeable more or less in all the returns, is particularly striking in the Basim report. In that district

two experiments at Shelgaon resulted in an average outturn of 10 maunds 1 seer and 11 maunds 30 seers respectively, as against other results, ranging from 1 to 7 maunds per acre. Probably these experiments were made on irrigated land; but if, this were the case, the fact should have been stated, in order that the figures might be excluded in calculating the average outturn from dry land. To mix up the two is obviously misleading. On the other hand, if the land was not irrigated, some explanation of the comparatively large outturn should have been afforded by the Munsarim.

Other points in the returns are open to criticism, but need not be referred to here.

7. Preparatory to sowing wheat, the land is carefully prepared with the native plough (*bukhar*), and manured, if possible. Beyond this no special attention is given to the crop. A careful cultivator will pass the *bukhar* (light plough) two or three times over his wheat land in the month of May, although the crop is not to be sown till October, the object being to soften the surface of the soil, so that it may absorb more of the rainfall. Being sown after the monsoon, weeding is unnecessary, and the cultivation is consequently less costly than that of cotton or other autumn crops.

8. I have come across cases in which the cultivators procured their seed from villages reputed to excel in the production of wheat, but the system of selecting seed does not generally prevail.

9. The following figures show the area under wheat cultivation in the past three years:—

	Acres.	Proportion to cultivated area.
1879-80	662,028	10
1880-81	744,870	11·2
1881-82	692,642	(Figures not received.)

A failure of some of the autumn crops in 1880 led to a larger portion of land being put down with wheat in that year, and the next year, as was to be expected, there was some falling off. But if the demand for Europe continues, a permanent increase in the cultivated area may be expected.

10. It is a matter for regret that the samples of wheat forwarded from this province are not amongst those reported on in London. Berar wheat is said to be well liked by exporters, and the impetus which has lately been given to the trade in it is a proof of this. The following information regarding the different qualities has been obtained chiefly from Messrs. Ralli Brothers, who are the largest buyers in the province:—

1st quality—*Soft white.* It comes in small quantities from the Ellichpur District.

2nd quality—*Hard white.* Comes partly from above the Ghâts, and is also obtainable in Murtazapur.

3rd quality—*Soft red.* There is very little of this quality in the province.

4th quality—*Hard red.* There is more of this kind than of any other It comes both from above the Ghâts and the Purna valley. The supplies from the Purna valley are preferred, as they are less mixed in quality

Soft white is worth 15 per cent. more than hard red wheat, but the latter is also in good demand for Europe, especially for France, where it is used largely in the manufacture of biscuits.

11. The export trade in wheat is a great blessing to the province. But it is only in its infancy as yet, and there is much room for development.

The following figures of the railway-borne trade during the past five years show how completely the direction of the trade has changed:—

Railway-borne Trade in Wheat.

	Import.	Export.
1877-78	31,790 mds.	38,013 mds.
1878-79	186,866 „	19,709 „
1879-80	282,370 „	13,641 „
1880-81	28,217 „	282,834 „
1881-82	390 „	1,839,098 „

The exports of the last season represent about half the crop of 1880-81 of the outturn is calculated at 5 maunds per acre. But the imports by road into the province (chiefly, if not almost entirely, from His Highness the Nizam's dominions beyond the southern frontier) are said to have been 1,35,281 maunds. The registration of road-borne traffic is far from perfect, and, considering the strings of carts and laden bullocks, which are to be seen bringing consignments of wheat from the southern frontier, I am inclined to think that a considerable portion of the traffic cannot have been registered, and that the estimate of 1,35,281 maunds, which is equal to about 11,250 cart-loads, or an average of 30 cart-loads per day, is rather low.

But, as the figures stand, the available supply of wheat in 1881-82 may be calculated to have been as follows:—

744,870 acres at 5 maunds	3,724,350
Imported from southern frontier	135,281
	3,859,631
Exported in 1881-82	1,839,098
Balance left for home consumption, including a small export by road.	2,020,533

12. The immediate requirements of the trade are—

(1) Well-regulated markets, affording facilities for bringing the producer in direct contact with the exporter.

(2) Storage sheds at the chief railway stations. This point, however, is not so important as the establishment of markets, although it is quite possible that at some places the two objects may be combined by locating the market near the railway station, and erecting sheds in it.

(3) Measures to distribute unmixed seed, and to ascertain which is the most profitable description of wheat to cultivate.

Small experiments might be made, either directly by Government officials, or through the medium of intelligent agriculturists, to obtain the requisite information under this head.

The points on which we specially require enlightenment are—

(*a*) Whether soft white wheat can be cultivated with success in all or in any particular parts of Berar.

(*b*) What is the respective outturn of (1) soft white wheat, and (2) hard red wheat, and which is the most profitable crop to cultivate.

The cultivators are quite alive to their own advantages. Hitherto they have not given any particular attention to the different qualities of wheat. It is only since buyers for the European market have arrived that the value of these qualities has been distinguished, and if we could prove by experiments which is the best kind of wheat to adopt, there would be little difficulty in getting cultivators to supply themselves with the seed.

By giving pure seed to some selected cultivators, there would be comparatively little difficulty in initiating a system of seed-beds.

It has already been proved in regard to cotton how rapidly the cultivators take to a new variety, if they (rightly or wrongly) think it is to their advantage to do so; and if anything is to be done by Government towards the development of the wheat trade, there is no better time than the present, when cultivators are impressed with the novelty of the trade, for initiating proceedings.

Statement showing the Result of Experiments to Test the Outturn of Wheat Crops in Berar in 1881-82.

Name of district.	Name of taluk.	Name of village.	Date when land was last manured.	Quantity and kind of manure used.	Date of which the land was last ploughed.	Area of experiment.	Average outturn of grain per acre.	Remarks.
1	2	3	4	5	6	7	8	9
						A. g.	M. s. t.	
Akola.	Akola	Chandur	Never manured	Not stated	In 1855	9 0	5 12 60	
		Do.	Do.	Do.	In 1853	6 39	6 24 20	
		Ghusar	Do.	Do.	In 1862	17 29	6 18 20	
	Akote	Kalwadi	Do.	Do.	Never	18 4	5 1 0	
		Akote	Do.	Do.	Do.	7 34	2 20 0	
	Balapur	Paras	Do.	Do.	Not stated	14 19	4 18 0	
		Do.	May 1881	240 carts of cow-dung.	February 1877	5 17	8 19 73	
	Julgaon	...	...	...	...	...	...	
	Khamgaon	...	...	...	...	...	...	
						79 22	5 19 0	
Buldana.	Chikhli	Not stated	Not stated	Not stated	Not stated	17 15	1 30 30	
		Do.	Do.	Do.	Do.	8 16	3 31 13	
	Mehkar	Do.	Do.	Do.	Do.	19 26	2 38 57	
		Do.	Do.	Do.	Do.	17 11	1 28 16	
		Do.	Do.	Do.	Do.	16 16	5 30 78	
		Do.	Do.	Do.	Do.	2 16	2 1 36	
		Do.	Do.	Do.	Do.	19 33	4 17 36	
		Do.	Do.	Do.	Do.	3 9	4 12 69	
		Do.	Do.	Do.	Do.	23 17	3 39 48	
	Malkapur	Do.	Do.	Do.	Do.	18 31	3 14 60	
		Do.	Do.	Do.	Do.	13 24	3 28 13	
		Do.	Do.	Do.	Do.	9 18	4 22 78	
						169 32	3 22 0	

Basim	Basim	Kasba Basim	Not stated	Not stated	Not stated	0	28	5 5 0	
		Mauza Ghorbabul	Do.	Do.	Do.	1	8	7 0 0	
	Pusad	Kasba Pusad	Do.	Do.	25th June 1881	7	18	6 20 0	
		Do.	Do.	Do.	21st June 1881	2	18	3 17 0	
		Do.	Do.	Do.	23rd June 1881	2	7	3 34 0	
		Mauza Nimbi	Do.	Do.	25th June 1881	1	22	*5 3 0	
		Mauza Shelloo B.	Do.	Do.	4th June 1881	2	31	5 24 0	
		Do.	Do.	Do.	19th June 1881	1	24	2 21 0	
		Kasba Umerkhed	7th May 1881	Do.	25th July 1881	4	16	2 7 0	
		Mauza Nageswadi	20th May 1881	Sheep manure	Do.	10	12	4 21 0	
		Do.	25th May 1881	Do.	30th July 1881	7	28	4 17 0	
		Daligaon	20th April 1881	Manure from Umerkhed carts.	12th August 1881	21	9	3 22 0	
		Do.	10th June 1881	Manure from Pound	8th August 1881	15	35	2 13 0	
		Bittergaon	Do.	Do.	15th August 1881	15	10	1 0 0	
		Do.	Do.	Do.	10th August 1881	15	9	2 14 0	
		Tiwari	Do.	Do.	Do.	25	34	1 34 0	
		Do.	Not stated	Not stated	5th August 1881	23	32	1 26 0	
	Mangrul Peer.	Mohogaon	Do.	Do.	Not stated	8	9	4 36 0	
		Shelgaon	Do.	Do.	Do.	4	3	10 1 0	
		Do.	Do.	Do.	Do.	1	29	11 30 0	
						173	22	3 10 0	
Amraoti	Amraoti	Chandur	Not stated	Not stated	25th November 1879	13	0	2 20 3	
		Ramgaon	Do.	Do.	27th May 1880	12	12	3 4 30	
	Chandur	Sateful	Do.	Do.	In 1873	27	11	7 34 36	
		Sanar Bujruk	Do.	Do.	In 1872	17	18	7 18 65	
	Murtizapur	Shirso	Do.	Do.	Not stated	7	33	1 38 17	
		Do.	Do.	Do.	Do.	12	8	3 31 58	
		Do.	Do.	Do.	Do.	11	5	3 6 59	
		Do.	Do.	Do.	Do.	5	4	2 36 53	
	Morsi	Erul	Do.	Do.	Do.	12	31	4 23 11	
		Do.	Do.	Do.	Do.	3	33	5 3 73	
		Do.	Do.	Do.	Do.	4	23	4 10 39	
						127	18	4 34 0	

It is doubtful whether this should be 5-3 or 15-19.

Statement showing the Result of Experiments to Test the Outturn of Wheat Crops in 1881-82—concluded.

Name of district.	Name of taluk.	Name of village.	Date when land was last manured.	Quantity and kind of manure used.	Date on which the land was last ploughed.	Area of experiment.	Average outturn of grain per acre.	Remarks.
1	2	3	4	5	6	7	8	9
						A. g.	M. s. t.	
Ellichpur.	Ellichpur	Tulwail	Not stated	Not stated	Not stated	27 19	7 2 2	
		Jussapur	Do.	Do.	Do.	8 30	2 28 0	
	Daryapur	Tilloree	Do.	Do.	In 1870	12 33	6 3 0	
		Panoree	Do.	Do.	In 1873	20 2	6 10 0	
		Sanglud	Do.	Do.	Not stated	6 3	6 4 0	
						75 7	6 3 0	

KHAMGAON,
The 6th October 1882.

(Signed) A. J. DUNLOP,
Assistant Commissioner,
Khamgaon.

No. 357, dated Hyderabad Residency, the 17th February 1883.

From—Major G. H. Trevor, Secretary for Berar to the Resident, Hyderabad,

To—The Commissioner, Hyderabad Assigned Districts.

In continuation of my letter No. 356 of this date, I am to convey the following further remarks on Mr. Dunlop's excellent report, many of the suggestions in which the Resident would commend to your attention.

2. Before anything is done in the way of modifying the variety of wheat now grown, it would be well to take a retrospect of past experiments. It must not be supposed that district officers in Berar have been unaware of the importance of improving the quality of the wheat crop. On the contrary, Mr. Jones believes that experiments instituted with this object have been made in almost every district. It is, for instance, within his recollection that the Deputy Commissioner, Ellichpur, obtained from the Nerrbudda Valley as seed, some of the best quality of wheat grown there, but found that it utterly failed in Berar. Mr. Jones is inclined to think that all necessary change in this direction will be brought about by the mere fact that European buyers are in the market and offer higher prices for one quality than another. This was the way in which the cultivation of cotton was improved. Government made many efforts, but nothing appreciable came of them.

3. Adverting to the proposals made in paragraph 12 of Mr. Dunlop's report, it may be noted that, in its weekly bazaars, Berar has a ready means for bringing the buyer and producer into contact. Almost all these bazaars are provided with covered sheds. But the development and regulation of bazaars near the railway are points that certainly deserve special attention. Sheds have already been erected at some railway stations, but they are only used by the people in the monsoon months, when the grain traffic is nearly over.

4. The statistics of the export of grain in 1881-82 deserve a fuller examination than Mr. Dunlop has been able to give them in his report.

5. Regarding the wide divergencies in the figures showing the average outturn per acre, you have already been addressed in my letter quoted above.

6. In conclusion, I am to request that the Resident's thanks may be conveyed to Mr. Dunlop for the care and attention he has shown in the preparation of his report.

No. 356, dated Hyderabad Residency, the 17th February 1883.

From—Major G. H. Trevor, Secretary for Berar to the Resident, Hyderabad,

To—The Commissioner, Hyderabad Assigned Districts.

Adverting to paragraphs 5 and 6 of the letter submitted with your office No. 5284 of 18th October 1882, the Resident desires me to invite your special attention to the rules promulgated in Commissioner's Book Circular No. XVIII of 1881. When Mr. Jones was in Berar he found reason to believe that the circular was not being anywhere intelligently applied, and he thinks it likely that the discrepancies to which Mr. Dunlop refers may be the result of such misapplication.

2. Had Mr. Jones remained in Berar it was his intention—

(*a*) to have prepared under his own superintendence and to issue to Munsarims perfectly uniform measures, each holding, say, about 5 seers of grain ;

(*b*) to issue an order prescribing the mode of measurement,—*i.e.*, whether the measure was to be piled up, or whether the grain was to be swept off to the level of the rim of the measure;

(*c*) then to ascertain, by a number of experiments made at his own office, the weight of one measure of each kind of grain ;

(*d*) to make the Munsarims use the measures issued to them and nothing else, and to enter in the column of the statement provided for this purpose the *number of measures* which they had measured for each field. This done, mistake would be impossible, for the Commissioner would have at hand the multipliers by which the number of measures could be turned into weights.

3. But, while Mr. Jones was away from Berar, tehsildars, he believes, supplied themselves with measures, and the uniformity which alone could have avoided error was thus lost. Some tehsildars, with a scrupulous accuracy that savoured of imbecility, provided themselves with half and quarter-measures, as if it could matter at all whether the last sweepings of a threshing floor were exactly measured; and very few tehsildars seemed to Mr. Jones to have grasped the fact that a measure of wheat does not weigh the same as a measure of linseed.

4. The Resident would suggest that, when the measurements, which, it may be assumed, are now in progress, have been completed, you should call in all the measures, and, destroying those that are not of one pattern, issue others specially made in their stead. It would at the same time be necessary to publish exact instructions as to the mode of measurement, and also to have experiments made under your own superintendence to ascertain the weight of a measure of each kind of grain. You might report the result to this office.

5. The matter may be put algebraically thus—

Let—

a = average weight of a standard measure of wheat.
b = average weight of a standard measure of jowari.
c = do. do. linseed.

and suppose that three fields sown with wheat, jowari, linseed, give respectively 200, 300, and 400 measures. Then the outturn will be—

Wheat	$200 \times a$
Jowari	$300 \times b$
Linseed	$400 \times c$

And it will be seen that, while, on the one hand, even a small error in a, b, or c, frequently repeated, very materially affects the result obtained, on the other hand it really signifies nothing whether, after 200 measures have been measured in a wheat-field, a seer or two measure over. Nevertheless, Mr. Jones believes that tehsildars took pains to provide themselves with small subsidiary measures to measure up, as he says, the last sweepings of the threshing floor, while they took none whatever to secure accuracy in a, b, or c.

6. The remarks made in this letter apply, *mutatis mutandis*, to the case of crops which, like cotton, have to be weighed, and not measured.

7. You might, if you should think fit, ask Mr. Dunlop to do for you what is suggested in this letter, but it seems to the Resident to be essential that the measures should be under the supervision of one and the same person. It was suggested above that the measure should be one of about 5 seers, but it matters nothing what its capacity is, provided that all are alike; a measure made to hold exactly 5 seers of one grain would not hold that amount of any other.

No. 434-23, dated Mysore, the 18th June 1881.

From—W. J. CUNINGHAM, Esq., Bo.C.S., Secretary to the Chief Commissioner for Coorg,

To—The Secretary to the Government of India, Home, Revenue and Agricultural Department.

I AM directed to acknowledge your No. 7—153-165, dated the 14th May 1881, forwarding copy of a communication from Her Majesty's Secretary of State for India, and calling for report on the points therein adverted to regarding the nature of the soils in which the better classes of wheats are grown, and the system of cultivation followed, &c.

2. In reply, I am to say that wheat is not grown in Coorg, but a copy of the paper in question, together with the "Supplemental Report on Indian wheat" therewith received, have been forwarded to the Dewan of Mysore, and he has been asked to give the information called for to the Resident, if it is convenient to furnish it.

No. 878, dated Shillong, the 16th July 1881.

From—C. J. LYALL, Esq., C.I.E., Officiating Secretary to the Chief Commissioner of Assam,

To—The Secretary to the Government of India, Revenue and Agricultural Department.

I AM directed to acknowledge the receipt of the Resolution of the Government of India in the Home, Revenue, and Agricultural Department, No. 7—153-165, dated the 14th May 1881, asking for certain information regarding the cultivation of wheat, and, in reply, to say that, as already reported in Mr. Ridsdale's letter No. 1145, dated the 21st April 1877, no wheat is grown in this province for the pupose of export.

No. 5104-18A., dated Rangoon, the 23rd July 1881.

From—G. C. KYNOCH, Esq., Assistant to the Secretary to the Chief Commissioner, British Burma,

To—The Secretary to the Government of India, Revenue and Agricultural Department.

I AM directed to acknowledge the receipt of Home, Revenue, and Agricultural Department Resolution No. 7—153-165, dated the 14th

May 1881, forwarding copies of the "Supplemental Report on Indian Wheat," and asking to be furnished with the particulars detailed in paragraphs 2 and 3 of the Secretary of State's despatch annexed to the Resolution.

2. In reply, I am to submit that wheat is hardly grown at all in this province. The latest returns show only 15 acres in the whole province under wheat. Wheat is grown in Upper Burma, but it is not possible to furnish statistics of the cultivation.

No. 294 I. G., dated the 17th February 1882.

Office Memo. from—CAPT. T. HOPE, Offg. Junior Under-Secy. to the Govt. of India, Foreign Department.

To—The Secretary to the Government of India, Revenue and Agricultural Department.

WITH reference to the communication from the Revenue and Agricultural Department, No. 4—221, dated the 17th October 1881, the undersigned is directed to forward letters marginally noted regarding the cultivation of Indian wheat.

From Resident in Nepal, No. 23 G., dated 29th December 1881, and enclosure with samples of wheat.
From Agent to the Governor General for Rajputana, No. 235 G., dated 30th January 1882, and enclosure.
From Agent to the Governor General for Central India, No. 10 G.—24, dated 11th February 1882, and 12 enclosures, with samples of wheat received from Baghelkhand Agency.

No. 23 G., dated the 29th December 1881.

From—C. E. R. GIRDLESTONE, Esq., Resident in Nepal,

To—The Offg. Secretary to the Government of India, Foreign Department.

REFERRING to Circular No. 768 I. G., dated 29th June last, from the Foreign Office, I have the honour to state that twenty samples of wheat grown in Nepal have lately been despatched to your address under separate cover from Katmandoo. The samples have been numbered *seriatim* in accordance with the figures in the first column of the enclosed list, which contains such information concerning the samples as I have been able to obtain.

2. The following extract from Notes on Agriculture in Nepal, drawn up by Dr. Campbell in 1837 when Surgeon of this Residency, may be of interest, as the cultivation of wheat in and about Katmandoo is practically conducted in the same manner still—

"There are two varieties grown in the valley,—the *Kato*, or Red; and the *Sheto*, or White kind. Both, however, are winter wheats, and undergo a similar description of culture. The wheat crop in Nepal is sadly neglected, compared with the rice and other crops. It is not a favourite food with the people, and until recently (say within the last twenty years) was but little eaten by the inhabitants, its use being confined chiefly to the distillation of spirits. So soon as the latest rice crop is off the ground,—*viz.*, at the end of November,—the wheat land is once turned up in ridges, the seed sown broadcast and covered in very imperfectly, by partial breaking of the clods with the crutch-like instrument which in this instance serves the purpose of harrows. In stiff clay soils the land is left in large lumps, the wheat sown, and, with very little care in covering, it is allowed to take its chance. As to the after-culture of the wheat crop,

it is as much neglected as its sowing; it is not once weeded, nor are the cultivators at the trouble of fencing it in any way from the inroads of their arch enemy the Brahminy bull, who during the spring and early summer revels uncontrolled among the wheat-fields. The wheat-sowing continues from the latter end of November to the beginning of January and February, but by far the greater part is sown in December. The reaping season commences about the middle of May and continues until about the 15th of June. The careless cultivation of this grain is in strong contrast with the admirable system pursued in raising the rice crops, and its produce is correspondingly inferior. The flour is not sweet or of high flavour, nor do the natives of the plains of India reckon it nearly so nutritious as that of Behar or Hindustan. There are a few local exceptions in the valley to this careless mode of cultivating wheat, but the above is the general system followed. Summer wheat is cultivated on the higher elevations in the interior of the hills to the north of Katmandoo, especially in the Cachar, or the tract of country lying along the bases of the snowy mountains, where it is, so far as my information goes, of superior flavour to ours in the valley."

3. Except in Deokhur and Dhang, I do not think that wheat is much grown for food. Rice is the staple article of consumption throughout Nepalese territory, and wheat is generally used for purposes of distillation. Except from valleys immediately adjoining the plains, wheat could not be exported at a profit because of the cost of carriage, which would more or less have to be performed on men's backs owing to the difficult nature of the country. The wheat grown in Dhang and Deokhur finds its way to the plains, and, so far as I have been able, I have indicated, in the case of the wheat there produced, the prices which obtained this year on the spot and at well-known marts outside the hills either in or near to British territory. It must be remembered that this year has been one of plenty in those parts and of low prices. There is in Deokhur much ground awaiting clearance, but in that valley, as in Dhang, there would be a difficulty in increasing cultivation quickly, owing to the paucity of the inhabitants. Both valleys are very feverish, and only Tharoos can withstand the malaria. So far the value of the wheat exported thence in one year has not exceeded one and a half lakhs of rupees.

4. The average proportion of seed sown to outturn is as 1 to 14.

Statement regarding Sample of Nepalese Wheat.

Number of sample.	District where grown.	Price.	Details of cultivation.
1	Doti . .	Not given . . .	Doti is the western province of Nepal, adjoining Pethoraghur. No. 1 is known as Malaiya-grown in Lerchum, 2 days' journey from Baithari. High-elevation land manured, not irrigated, and subject to rotation of crops. Effect on land not known.
2	,, .	,, . . .	No. 2 is known as Dobat khane-grown in Changaun, 1 day's journey from Baithari. Low-elevation land irrigated for rice, but not for wheat; manured and with rotation of crops.
3	,, . .	,, . . .	No. 3 is known as Jhusia-grown close to Baithari. Moderate elevation. Ground manured, but not irrigated. Rotation of crops

Statement regarding Sample of Nepalese Wheat—concluded.

Number of sample.	District where grown.	Price.	Details and cultivation.
4	Doti .	Not given . . .	A mixture of Nos. 1, 2, 3. Commonly used in Doti at high elevations. Ground manured, but not irrigated. Rotation of crops.
5	Deokhur .	43 seers Co.'s Re. in Deokhur and 35 seers in Nepalgunj.	Deokhur is the first valley within the hills (the Doondwa range) to the north of Oudh. The elevation is low. I visited it three years ago, under much opposition from the Durbar. Much of the land under wheat has recently been cleared, and the virgin soil produced splendid crops. The wheat, which is a spring crop, is sown in the stubble of the previous rice crop, and is neither manured nor irrigated, though irrigation is available if necessary.
6	Do. .	43 seers in Deokhur and 33 seers at Babagunj.	
7	Do. .	43 seers in Deokhur .	
8	Do. .	40 „ „ .	
9	Do. .	43 „ „ and 33 seers at Bahadurgunj.	
10	Dhang . . .	43 seers in Dhang and 31 seers at Pachperwa.	Dhang is the valley immediately to the north of Deokhur, and is separated from it by a range of hills. The elevation is low, but higher than that of Deokhur. It has been longer cleared than Deokhur. The cultivation of wheat is the same as in that district.
11	Do. . . .	43 seers in Dhang and 30 seers at Biscohen.	
12	Do. . . .	42 seers in Dhang and 34 seers at Bahadurgunj.	
13	Do. . . .	40 seers at Tulsipore .	
14	Sonar . . .	36 seers at Sonar .	
15	Banki . . .	34 seers at Banki .	Banki is in the plains. The cultivation of wheat resembles that of Oudh.
16	Chittong . .	20 seers on the spot .	Chittong has an elevation of about 6,000 feet and Toomlung Palum about 5,500 feet; Katmandoo about 4,200; Perphing in the Katmandoo Valley about 4,800. The cultivation in all these valleys, which lie close to one another, is thus described by Dr. Wright, formerly Residency Surgeon; "In the less easily flooded lands, a crop of wheat is grown in the cold season, and the next spring gyah, or upland rice, followed by oord, or some other kind of pulse. In the moister lands of the upper level, the wheat is followed by radishes, mustard, buck-wheat, or earth-nuts, and these again by transplanted rice. In the best lands the succession of crops is simply transplanted rice followed by wheat, or by mustard, radishes, or garlic. Sometimes in the dry lands wheat is followed by Indian-corn, or ginger, turmeric, and red-pepper are grown."
17	Toomlung Palum .	20 „ „ .	
18	Perphing . .	15 „ „ .	
19	Katmandoo . .	16 „ „ .	
20	Do. . . .	For private consumption.	Grown at the Residency (elevation 4,500 feet) from country seed on land fairly manured and twice ploughed, but not irrigated for wheat. The rotation is Indian-corn followed by oats one year, and Indian-corn followed by wheat or barley the second year. The soil needs manuring to prevent exhaustion.

NOTE.—The seer here intended is the British seer of 80 tolahs, and the rupee is the British coin.

C. E. R. GIRDLESTONE,
Resident.

No. 235 G., dated Abu, the 30th January 1882.

From—The Officiating Agent to the Governor General, Rajputana,

To—The Secretary to the Government of India, Foreign Department.

In reply to your office Circular No. 768 I.G., dated the 29th June 1881, I have the honour to forward a "précis" of the information which has been received from the different officers under this Agency, regarding wheat cultivation in Rajputana.

Wheat Cultivation in Rajputana.

The Government of India require information on the following points:—

A.—(1) A description of the nature of the soil in which the better classes of wheat are grown.

(2) The system of cultivation followed.

B.—It having been alleged that the productive power of the soil in some parts of India has begun to fail, it should be ascertained whether there is any evidence of this in respect to the quality and quantity of the wheat crop raised.

Particulars regarding the Above Points ascertained from the Individual States comprised in the Rajputana Agency.

Marwar.

A.—(1). The descriptions of wheat produced are as follows:—

(*a*) Soft red, called Kharchia.

(*b*) Soft white, called Mithania or Bagra.

(*c*) Hard red, called Katha.

Of these the best is Kharchia.

Wheat class (*a*) Grown in soft sandy soil, mixed with clay. Irrigated by water, from natural and artificial sources, which has considerable saline properties. The soil requires profuse manuring, and its productiveness is considerably increased by timely rains.

One acre produces from 30 to 40 maunds, and requires about 35 seers of seed.'

This land can only be tilled every alternate year to advantage.

The crop requires watering from 4 to 8 times yearly.

Wheat class (*b*) is grown in soil same as above and irrigated in the same way. To crop land watered by wells more manuring is necessary than in the case of lands watered from tanks or rivers. The outturn is from 45 to 60 maunds per acre, requiring about one maund and 5 seers of seed. If abundance of manure be employed, successive yearly crops may be raised successfully.

Wheat class (*c*).—This class is grown in lands which from different reasons are periodically flooded. The description is either hard red or soft red; the former is produced by hard soil, and the latter by soft sandy soil. This crop can be raised every year should the land be well flooded. The return is, generally speaking, poor—from 10 to 30 maunds per acre, requiring 15 seers of seed.

Eastern States.

A.—In Jeypore the better classes of wheat are grown in "Dhamni" and "Peeli" soils. The ground is ploughed five or six times. The seed is sown broadcast about the end of September.

Lands irrigated from wells require 15 seers of seed per bigha, and produce 7 to 10 maunds best wheat. Those irrigated from tanks require 10 seers seed, and produce 3 to 5 maunds per bigha of inferior quality. One hundred maunds manure per bigha required for "Dhamni" and "Peeli," irrigated from wells. Sandy and low lands irrigated from tanks require 150 maunds manure.

B.—The quantity and quality of the returns deteriorate if the land is sown with wheat year after year without intermission; the system found to answer best is that of raising crops of wheat and cotton in rotation.

Ulwar.

A.—Superior classes of wheat are not grown in this State.

Class C, soft red, almost exclusively cultivated.

It is grown in the following soils: "Chiknot," a clayey loam; "Matyar," a sandy loam; "Bhur," more or less pure sand.

The system of cultivation is as follows: the land is ploughed four to eight times; the crop is watered four times.

Clayey loam well manured yields 30 maunds per acre.

The average yield of three soils mentioned may be taken as 30, 15, and 5 maunds per acre respectively.

B.—The crops of late years have been inferior. The Durbar attributes this to the reduced condition of the agriculturists, and not to any defect in the soil.

Kotak.

A.—The best soil on which wheat is grown is termed "Sri mál," and is a rich black loam. It is also grown to a certain extent on second and third rate lands termed—

Utár mál (lower land);
Chapar mál (brownish loam);
Pili mál (yellow loam).

The land is ploughed four times; 40 or 50 seers of wheat are sown to the acre. The land is scarcely ever irrigated or manured. In lands of the first quality, wheat may be sown successive years, but it is usual to alternate by a crop of gram. In lands of inferior quality, various crops are sown in rotation.

The yield varies from 4 to 16 maunds per acre.

B.—In late years the quantity and quality does not seem to have deteriorated.

Meywar.

Wheat is one of the main cold-weather crops. It is either grown unwatered and unmanured, or as an irrigated manured crop. Unirrigated wheat is usually of the red kind, and is grown in the best pure black soils. The best soils will produce wheat successive years; the

second best land requires that wheat should periodically give place to some other crop. There is an inferior sort of black soil, which also produces wheat, but the outturn crops are not abundant.

Eighty lbs. of seed are required per acre of the land in which the wheat crop is alternated, and 110 lbs. of seed to an acre of those lands which are sown with wheat only.

The seed is not chosen by the ryots, as they always send all their grain to the mahajuns, who dispose of it for them and return them grain for seed at the right time of year. This grain it is to the interest of the mahajuns to send as good as possible, as the quality of the next crop will depend upon it. The crops are damaged by insects and wild animals, also by a blight called "Kaima," the peculiarities of which are that the ears of wheat turn black and crumble into powder on being touched. Owing to the above causes, and the uncertainty as to whether the weather will be favourable or not, it is very difficult to estimate the probable outturn. One acre generally yields from 4 to 16 maunds, according as the land is good or bad, and according as circumstances which influence the yield are favourable or adverse. Although, no doubt, there is peculiar virtue in virgin soils, still land which has been under cultivation for centuries is yielding 9 to 10 maunds per acre.

Irrigated Wheat.

This is much more easily dealt with than dry wheat. The outturn is much more certain; the white variety is generally sown, and irrigated wheat is much less susceptible of damage. For this crop the sandy and loamy soils are used. The land is manured, but not so heavily as for other crops.

The average outturn is 20 maunds for double, cropped land, and 25 maunds per acre if no crop has preceded it.

The crop depends upon manuring, and irrigated land soon deteriorates if plenty of manure is not applied. The wheat grown on irrigated lands sells slightly better than that of the dry cultivation.

Bikanir.

The cultivation of wheat is precarious and limited in extent.

The land round a dozen villages to the west of Bikanir produces wheat. Comparatively little else is raised in the State, except when the rains are unusually abundant, and there is but one harvest in the year.

Dholpore.

The best wheat is obtained from the Kachar lands on the banks of the River Chambal. They are flooded by the river, which on receding leaves a fertilising deposit. These lands are ploughed once and weeded once. The cost of cultivation, including seed, comes to about Rs. 23 an acre. The average outturn is 40 maunds per acre. It is a curious fact that all the cultivators assert that seed raised on these lands produce better crops than if the Kachar lands were sown with seed raised elsewhere. The next best wheat is grown in black soil termed Mar.. Of this soil there to two kinds:—

1. *Dún.*—This soil is flooded in the rains. For wheat the land is ploughed twice and the crop twice weeded. The average produce is about

30 maunds per acre. These lands do not require manure or artificial irrigation.

2. The second description of black soil requires manure and irrigation. The outturn from it is about 25 maunds per acre.

There are about 18,000 acres of less productive soil than the above in the Dholpore State, which are sown with wheat. This class of land is chiefly situated close to village sites, and, therefore, manured at small expense. The average outturn is about 18 maunds per acre. Nothing but red-bearded wheat is sown in the State, and wheat is grown year after year in the same soil. From comparing statistics regarding this crop, there appears to be no reason to suppose that the productive power of the land is less than in former years.

Jhallawar.

The kinds of wheat generally grown are as follows:—

(1) Daudkhani,
(2) Katha or Kathia.

The two kinds are, however, more frequently sown mixed (locally named Gujjac). These wheats are grown on unirrigated land, the soil of which is for the most part the well-known loose black loam of Malwa. Manure is not used, and the average yield is said to be 2 local maunds per local bigha, which is equivalent to $5\frac{13}{16}$, or nearly 6 bushels an acre.

Judging from experiments made at head-quarters in the past two years, the Political Superintendent is of opinion that the yield is under-estimated. The area of irrigated wheat is small, being, it is calculated, in the proportion of 1 to 22, as compared with unirrigated wheat crops. Irrigated wheat land is manured, and the average yield is estimated at 6 local maunds per local bigha, or $15\frac{3}{5}$ bushels per acre. The cultivation of unirrigated wheat commences with the preparation of the ground during the end of May and beginning of June, when the soil is harrowed.

During the rains in June and July hoeing and weeding goes on.

In September and early in October the land is ploughed three or four times, after which, late in October and early in November, sowing proceeds, the heavy dews usual at that season materially assisting germination. An average crop, however, requires the cold-weather rain, which generally falls for a day or two in the month of December or January. The harvest is gathered in April and May, and the grain is trodden out by bullocks.

Wheat is sown in rotation with jowar (large millet) or gram. The soil is said to have diminished in productiveness, but there are no data by which this theory can be tested.

Harowtee and Tonk.

In the northern portion of Bundi and Tonk, and in Shahpura, where the soil varies and is made up of second class black, brown, and yellow soil, wheat is raised on both irrigated and unirrigated land, but principally on the former; while in the southern districts of Bundi and Tonk, where the soil is first class black, and all that can be watered is appropriated for opium, it is largely grown on unirrigated land.

The system of cultivation is as follows:—

Irrigated land.—The land is ploughed in June before the annual rains set in, and is ploughed a second and third time during the rains. In the end of September the land is manured and ploughed for the fourth time.

A heavy flat piece of wood * is then dragged over the field to pulverise clods. About the end of October the land is once more ploughed and pulverised, and the seed is sown with a drill plough.† When the first shoots appear above ground, the fields are watered, and again after a month, and (should there be no rain) a third time after the corn has got into ear. Too much water is believed to produce mildew.

* Châwar.
† Nai.

The corn is trodden out by bullocks and winnowed. The manure used consists of cattle, sheep, and goat dung, litter and village refuse: 128 maunds, or 10,240 lbs., is stated to be the very smallest quantity allowed per acre, but, where possible, two and three times the amount is given.

The average outturn per acre varies from 13 to 21 maunds—1,040 to 1,680 lbs. Regular rotation of crops is observed, wheat being sown every second year, and a double crop of Indian corn and barley being raised in the intermediate year. The land is, as a rule, manured only when wheat is raised.

Unirrigated land.—The process of preparation is much the same as for irrigated land, except that the land is neither broken up till after the first few falls of rain, nor is it manured. If the rainfall is favourable, the outturn varies from 5 to 8 maunds—400 to 640 lbs.

Wheat and jowar (millet) are usually sown in rotation.

Wheat is ordinarily divided into two classes, "Baja" and "Katha"—the former raised principally on irrigated, the latter on unirrigated land.

"Baja" is considered superior, except in Harrowtee, where "Katha," grown on the rich unirrigated land, is very fine. It is universally considered that the productive power of the land, has diminished. This fact is ascribed to insufficient manuring, and to the soil being seldom or never allowed to lie fallow.

No. 10 G.—24, dated Indore Residency, the 11th February 1882.

From—2nd Assistant, Agent to the Governor General for Central India,

To—The Secretary to the Government of India, Foreign Department.

In reply to your office circular letter No. 768 I.-G., dated 29th June 1881, and subsequent reminders, I have the honour, in absence of the Agent to the Governor General, to forward reports from the Political Officers, &c., marginally noted, on the cultivation of Indian wheat in Central India Agency.

Political Agent, Bhopal.
" " Baghelkhand.
" " Bundelkhand.
" Superintendent, Charkhari.
" Agent, Gwalior.
" " West Malwa.
" Assistant, Goona.
" Agent, Bhopawar.
Indore Durbar.
Dewas, Senior Branch.
" Junior "
Bagli State.

No. 778, dated Bhopal Political Agency, Sehore, the 24th November 1881.

From—Colonel W. Kincaid, Political Agent, Bhopal,

To—The Agent, Governor General, for Central India, Indore.

Referring to your circular No. 61 of the 20th July last, and its several reminders, relative to the cultivation and production of Indian wheat, I have the honour to inform you that in this district three sorts of wheat are produced, *viz.*—

1st sort.—Daud-khani, white, mixed with little red wheat, sown in October and November in deep black-soiled ground. For 40 seers of seed an acre it yields on an average 160 seers.

2nd sort.—Kuthia, or red-coloured wheat; sown in black and yellow soil in the above-mentioned months, and the average production per acre is the same as above.

3rd sort.—Pishia, or white; coloured wheat sown in old cultivated ground in the above months and the average production is the same as above.

The 1st sort is sown in newly-prepared ground whereas the 2nd and 3rd sorts are sown in old cultivated ground. Neither manure nor irrigation is used to enrich the ground for the cultivation of wheat. Slight showers of rain in January cause a greater production. If the best seed, or Daud-khani, is sown in the old cultivated ground, the production per acre is only about half the average.

The 1st sort is soft, and, with little exception, kept for home consumption, and 2nd and 3rd sorts are harder and largely exported.

During the latter part of the rainy season, the ground is ploughed and prepared for sowing, which takes place in October and November, as above stated.

As shown above, the old cultivated soil yields wheat of inferior qualities, yet the quantities are not less than the average production of the best.

This information has now been obtained locally, the report from the Native State of Bhopal not having yet been received.

Translation of a Report from the Bhopal Durbar on the Cultivation and Production of Wheat in Bhopal District.

There are three sorts of land in this country, *viz.*—

1st sort.—Kalmat, or black soil, free from kunker and stone.

2nd sort.—Bhamar, or brackish soil.

3rd sort.—Seyar.

In the 1st and 2nd sorts of the soil, wheat is sown,—the 1st sort producing the best wheat, whereas the 2nd sort produces inferior quality and less quantity.

There are four sorts of wheat produced, *viz.*—

1st sort.—Bland khani, a rich white-coloured gehún.

2nd sort.—Khattia, or red gehún.

3rd sort.—Khabra, or white, mingled with red gehún.

4th sort.—Pishia, or sufed gehún.

Mode of sowing.—From the beginning of the rains until the month of October, the ground is ploughed four or five times. Sowing is commenced by the end of October and beginning of November. Reaping commences in March.

It is not customary in this province to use manure or irrigation to enrich the soil.

Production.—For ten *passari* (a passari is five seers) sown, it yields thirty, forty, and fifty passari per bigha. The zemindars say that the soil does not yield such quantities as formerly, and that the productive power of the soil will be improved on the introduction of manure.

No. 1067, dated Baghelkhand Agency, Rewah, the 31st August 1881.

From—The Political Agent, Baghelkhand,

To—The First Asst. to the Agent, Governor General, for Central India.

I HAVE the honour, with reference to your circular No. 61, dated 20th ultimo, with accompaniments, to report that none of the wheats grown in this part of Central India come under the denominations cited therein. They may be found classified in the margin under the local names, of which I beg to subjoin a brief description. Samples of each are forwarded in separate packet.

Red Wheat.
1. Kathia.
2. Kuthoyee.
3. Pisia.

White Wheat.
4 Sathia.
5. Cabalia or Dawdi.

Kathia, the *best* wheat, is grown in black or cotton soil (Muir), which is manured, but not irrigated, for the crop.

Kuthoyee, a red wheat of small grain, is also grown in black soil (Muir), unmanured.

Pisia, a smaller and softer red grain, is grown in lighter soil (Dometia).

Sathia, a large-grained white wheat resembling Kathia, is grown both in the black soil and in lighter soil called Dometia.

Cabalia or *Dawdi*, the smallest and softest of the white species, is grown in light soil (Dometia).

The whole district is dependent on the rainfall; irrigation to crops is at present unknown. The better classes of wheats are raised on manured black soil. The system of rotation of crops is practised in the district to save lands, which are scarcely allowed to lie fallow, from losing their productive power. Lands are alternately cultivated with wheat in one year, and jowar or cotton in the next. The average yield per acre is estimated at about 13 maunds, and the maximum outturn from well-manured land is, perhaps, double that quantity.

Translation of a Memorandum on the Cultivation of Wheat in Bundelkhand by MUNSHI CHUNDI PERSHAD, Superintendent of the Chhatarpur State.

THE best descriptions of wheat are produced in the black loam commonly known as "Mar."

A little before the setting-in of the rains—*i.e.*, at the end of May or beginning of June,—the ground in which it is proposed to sow wheat is harrowed with an implement known as a "bukkhar," which has one iron tooth attached to it, and which is dragged by a pair of bullocks.

The object of harrowing the field is to clear it of weeds and grass, and specially of kans "or bind-weed." The stumps and roots of the last crops are also thus removed. After this the field is left alone for some time.

After the setting-in of the monsoon, and when the land has been well moistened by three or four good showers of rain; it is ploughed in July, and if there has been a scarcity in the fall of the rain, it is again ploughed in August, otherwise not until September.

If necessary, the field is again harrowed to clear it of weeds and grass, but usually it is only ploughed and the wheat sown by means of a simple little implement known as "nari."

A "nari" is a small bamboo having a saucer-shaped piece of wood affixed to the top in which the seed is placed.

The "nari" is fixed a little behind, but very close to, the share of the plough; thus, the field is ploughed and sown at the same time, the share of the plough making in the earth a furrow or trench about a foot deep; and by means of the "nari" the seeds are gradually deposited in the furrow.

After the field has been sown, a "patta," which consists of a heavy log of wood, about 7 or 8 feet long and 1 foot broad, is dragged over the ground, a couple of men sitting on it so as to give additional weight and so level the land, and at the same time the seeds are covered with earth.

If, before sowing, it is observed that the land is not sufficiently moist on account of an insufficient fall of rain, gram is mixed with wheat (the mixture is called "Birra"); while, on the other hand, if the land could not be ploughed till about the middle of August on account of an excess of rain, then wheat will not be sown in it—only gram will be sown.

Wheat is generally produced in Bundelkhand without irrigation. If occasionally wheat is sown in one or two bighas of land near a well where barley is usually sown, then the wheat will be watered, but only once. In lands near wells, barley, *pisia* (red wheat), and *butra* (a kind of pulse) are generally sown. *Pisia* is a small kind of wheat, and is produced in great abundance in Bundelkhand. The flour of this wheat is like that of the large common wheat, but is less easily digested.

Manuring increases the produce of wheat. Fields are usually manured once every three years. The people of this part of the country consider that the manure remains efficacious for three years. Manured lands are not irrigated. Very few farmers can afford to manure their fields, only those who have a number of cattle in their houses being able to do so.

Crops that are raised by means of irrigation are called "Dharwar," while those that are left dependent on the supply of rain are called Nagarwar." The black loam or "Mar" in Bundelkhand is not rich enough to produce wheat every year. On manured lands, no doubt, wheat may be raised for two or three years continuously. The common practice here is to sow wheat and jowar or kapas in alternate years. The reason of this alternation seems to be this, that the produce of wheat is good

when it is sown after jowar. Some farmers let their fields lie fallow for three or four years, after which period, if wheat is sown, the produce is very good. In those fields in which water is confined by a dam during the rainy months, there wheat can be grown every year. This practice of retaining the water in fields is very common in the districts of Hamirpur and Saugor, and there wheat is sown every year in the same fields. The practice of confining water may be described as follows:—

The fields are filled with water during the four rainy months. In September the dam is broken on one side and the water is allowed to escape; when the land is sufficiently dry, it is ploughed once and the wheat is sown. Such crops seldom prove a failure.

If the fall of rain during the four rainy months is regular and timely, and if there are also good showers in December or January, called "Mahawat," then from a properly-manured field the produce of wheat may be estimated at 12 maunds an acre, while in a field that has not been manured it will amount to about 8 maunds an acre. It takes about 1 maund and 10 seers of wheat to sow one acre; the produce is not more than ten-fold.

Cultivators say that if a field is sown year after year and is not manured every third year, its power of production will grow less, and again, in a field which has been overrun with "kans" or bind-weed, the productive power of the soil is materially diminished.

Wheat in Charkhari Territory.

"Lal Gehún" of excellent quality is grown in the Satwara and Bawan Chaurasi parganas. For its successful cultivation it is necessary that no "kans" (a grass used in Charkhari for thatching purposes) should be allowed to grow on the soil, as it is very injurious to the growth of wheat. For three months and a half, from the beginning of Asadha (June) to the middle of Kuor (September), the soil is prepared by being ploughed eight or ten times when the rainy season is over. The sowing begins and continues throughout October.

The soil in which wheat is grown is called "Mar," and is a black soil which retains a great deal of moisture, and, therefore, requires no irrigation, but is always manured. To prevent, in a measure, the productive power of the soil from falling off, the farmers have recourse to a rotation of crops, and sow jowar and kapas, at intervals. The average annual produce per acre is 10 maunds. This soil after some time degenerates, varying from twelve to twenty years in different places. The amount of produce is then reduced to one-half of the usual outturn, but the grain does not suffer in quality at all. If left fallow for about eight years, the soil is restored to its former condition.

Lal Gehún is also grown in the Esanagar district, both on "Mar" and on soil of a sandy description. The "Mar" in this pargana is mixed with kunkar, and its productive powers, therefore, are not so great as in Satwara and Bawan Chaurasi, the average weight of crop per acre being only 4 maunds. The other description of soil in this pargana is irrigated, and yields crops of equal weight per acre to that grown on the best "Mar."

Statement showing Description of Wheat grown in the Gwalior Territory, and th Nature of Cultivation, &c.

No.	Name of wheat.	Description of soil in which grown.	How raised.	Average outturn of each bigha.	Remarks.
1	Lálkathia .	Mar (clay) land	From rain water.	5 maunds .	By turning Mar land from na tural (rain) to artificial (well &c.) irrigation, the outtur may be increased to 1 maunds per bigha, but, gene rally speaking, wells are no sunk in Már land, as the bot tom is found to rest on Path (rock), and during hot weathe the land splits off in severa places. Where there are ma sonry works, such as tank and large wells, the zemindar grow opium, instead of wheat to get greater profit.
2	Bangashia .	Ditto .	Ditto .	5 ditto . .	Outturn may be raised by arti ficial irrigation.
3	Pisia . .	Pandwa (mixed clay and brown land).	By irrigation .	10 ditto . .	
4	Bhore Pisia .	Ditto .	Ditto .	10 ditto.	
5	Daud-khani .	Pandwa and Mar land (brownish).	From rain water	6 ditto . .	Daud-khani wheat grows on th Malwa land.
					N.B.—Both Kharif and Rab harvests may be reaped in th same year from low land having sufficient moisture i well manured. Wheat is no generally sown on the same field every year, but alternately with gram, masúr, &c.

No. 765, dated Agar, the 22nd November 1881.

From—Major A. H. S. Neill, Offg. Political Agent, West Malwa,

To—The First Assistant Agent, Governor General, for Central India.

In reply to circular No. 61, dated 20th July 1881, calling for the opinions of competent persons regarding the state of the wheat cultivation, I have the honour to submit the following for the consideration of the Agent to the Governor General.

2. In Western Malwa whatever wheat is cultivated is produced almost entirely on land that is not irrigated or watered. The mode is to plough the land twice or thrice during the rains (July to September), and again in November, when the seed is put in 24 to 30 seers per bigha. The most favourable ground is the black cotton, which has at least 6 or 7 feet of good soil before stone or rock is touched. The produce, or outturn, from such soil when fresh and in a virgin state is from 4 to 5 maunds per bigha; on land where the soil is 1½ to 3 feet deep, the produce will be from 2 to 3 maunds per bigha only. The same land is usually kept for wheat, and after five or six years of consecutive cultivation the soil becomes very impoverished and stale, producing

barely two-fold of a very inferior grain to the seed sown; to remedy this, sometimes gram is substituted for wheat, but this does little good. Sometimes "Tilly," or "Rummalie," is sown in the rains and ploughed into the land afterwards as manure. But, as a rule, the land, when it is so poor as not to be worth cultivating any longer, is allowed to lie fallow for a year or two, when it recovers somewhat. No manure is ever thrown on the wheat lands; as a rule, the land is too far distant from the villages, and all available manure is kept for the opium lands. Wheat is very seldom grown by irrigation in these parts, but, if so, the land is first well prepared and dressed with manure; the same amount of seed is used, and four to five waterings are required, and the produce is from 8 to 10 maunds per bigha; but the grain is of a reddish colour, and is considered very inferior to the white wheat grown on the unirrigated lands. Wheat grown by irrigation takes it out of the land very considerably,—so much so, that land on which such a crop is raised is considered too poor to grow opium, &c., the following year.

3. The general opinion seems to be that there is no doubt that the wheat lands are gradually falling off in fertility, for the very reason that the land is getting more and more valuable, and is consequently harder worked and has less time allowed it to lie fallow and recover its strength.

Brief Report on Wheat Crops raised in Goona District.

THERE are three descriptions of soil in which wheat is raised, *viz.*—

1st class { Mar—a heavy black soil.
Dor—a lighter kind of red soil.

2nd class { Chikta—low-lying lands.
Putrooa—coarse soil, interspersed with khunkar.

3rd class ... Chupra—rough stony land.

2. The best kind of wheat is raised on Mar soil. The land is never manured for a crop of wheat in this part of the country. Wheat raised on irrigated land is called "Pisiar." It is by no means the best kinds but the amount of grain raised on irrigated land is usually twice that on other soil.

3. The soils of the 1st and 2nd classes—*viz.*, Mar, Dor, Chikta, and Putrooa—supply wheat crops successively, year after year. Occasionally a crop of gram or jowar is substituted for a change, but the land is never left for a season uncultivated.

4. The average produce of wheat raised in the best kind of soil is about seven times the amount of seed sown per bigha. On second class soil only four times the weight of seed would be raised.

5. It is a general complaint throughout the wheat-growing district of this neighbourhood—*viz.*, the Sonbhats of Bujrunghur, Isaghur, and Bhelsa—that the productive power of the land is gradually failing. During the last twenty years it has been noticed that there has been a gradual diminution in the quantity of grain raised, though the quality continues to be about the same.

6. There are three kinds of wheat which are chiefly raised in this district—

1st.—Dhaud-khani—, a good, large white kind.

2nd.—Lall-katia—, red, hard and soft.

3rd.—Pisiar—, a coarser kind raised on irrigated lands.

No. 603, dated Sirdarpore, the 14th September 1881.

From—Lieut.-Colonel James Miller, Offg. Political Agent, Bhopawur,

To—The 1st Assistant Agent, Governor General, for Central India.

With reference to your No. 61 R.—1, dated 9th instant, and to circular No. 61 of 20th July 1881 (*subject*—Production of Indian wheat), in which information is requested, if it can be obtained from competent persons, on the following points, *viz.*—

1. Whether the best wheats are raised on irrigated or on manured land.
2. Whether the land has been long cultivated with wheat crops.
3. What is the average weight of crop per acre?
4. Whether there is any evidence, from the quality and quantity of the wheat crops raised, that the productive power of the soil has begun to fail.

2. From such information as I have been able to gather, as well as partly from my own personal knowledge, I have the honour to state generally that the following answers may be considered correct, for this Agency, *viz.*—

1. As a rule, it may be considered that there is but little wheat raised on irrigated land, though in Nimar it is of rather more frequent occurrence. Where it is so raised, manuring also would always be resorted to. The latter *only* would, however, also be resorted to on lands which are not irrigated, about every second year. These non-irrigated lands, where of black soil, produce very often very fine crops of wheat. On some very good non-irrigated land this manuring is not necessary. *No doubt*, "the best wheats" would be raised on irrigated land, but that land would be manured also, and it is not the *usual* system of wheat cultivation.
2. Much of the good wheat land continues year after year to bear wheat crops, and no rotation of crops is found necessary. In some cases, however, other crops are sown the second or third year.
3. The average weight of (wheat) crop per acre,—an average per *bigha* might be considered from 1½ mannies upwards, (360 seers), or, say, per *acre* 600 seers roughly.
4. There is no evidence, from the quality and quantity of the wheat crops raised, that the productive power of the soil has begun to fail.

No. 881, dated Indore Durbar Office, the 5th November 1881.

From—KHOOMAN SINGH, in charge Durbar Office,

To—CAPTAIN J. BURNE, 2nd Asst. Agent, Governor General for Central India.

WITH reference to your office No. 1823, dated 9th September last, I beg to furnish you with the following information :—

Good wheat is produced on light brown soil. The system of its cultivation is as follows :—

In the monsoons the fields in which wheat is to be sown have to be furrowed and tilled three times. When the rainy season is about to end, land is again ploughed, and the grass and stubbles are removed from the fields. This being done, wheat is sown. Nothing further is done. From sowing to harvest takes about three months and a half.

Wheat can also be sown to advantage in Nimar, on irrigated soils. There is no necessity, however, of using expensive manures; nor are they used by the people. Care should always be taken that if in one year wheat is sown, in the next year linseed or gram must be sown. Continued sowing of wheat for ten years in the same field necessitates giving the land rest for some period.

The average quantity of wheat produced in one bigha varies from 4 to 6 maunds.

The productive power of the soil is really failing in many parts of the country. The reason of this is that the tillers of the soil, being ignorant, cannot see the advantage of improving on their modes of cultivation. Besides, many of them are so conservative in their principles that they will not adopt any improved modes of cultivation, but will invariably stick to the same methods as are handed down from father to son. Every year they try their best to raise as much grain as they possibly can from their fields, and do not much trouble themselves to look to the causes of the deterioration of the land, as well as its remedies. The result of all this is that the soil is much exhausted and has, consequently, lost much of its fertilising powers, and the outturn now-a-days falls below the average yield.

This exhaustion of the soil can be remedied in two ways,—namely, the land which is under cultivation from a long time should be for some time left fallow; and, secondly, improved machinery and appliances of scientific manures should be introduced. Very little margin of land being at present available for cultivation, there is, however, no option left to the cultivator but to resort to tilling the same land over and over again. As for the other remedy, I have already noted that the peasants are averse to introduce costly machinery and manures.

Abstract Translation of a Report of Dewas Vakil, Senior Branch, on the Subject of the Production of Wheat.

BLACK clay of sufficient depth to retain moisture for a long time is required for the cultivation of wheat. Sandy soil of brown colour yields less than the black one. The wheat grown in the Dewas territory is of the following kinds.

White, Red, Borya (which is not bearded), and Mugsi.

As the fallow land, when newly brought under tillage, contains excessive heat, it yields a scanty crop during the first year, the produce being less than the seed sown.

The method of cultivation is as follows:—

At the commencement of the rainy season, after one or two falls of rain, the land is ploughed. Subsequently, during the intervals of fair weather, it is again twice ploughed, so that the grass that has grown in the meantime is rooted out and rots there. In the month of Koowar (October) the land is again twice ploughed, and gram, or a mixed quantity of gram and wheat called Baijhar, is sown.

Some people sow Ramshi and Til seed instead. Next year, during the month of Baisakh, the land is first harrowed, so that it absorbs heat and the grass is uprooted. After two or three falls of rain, the previously mentioned operations are gone through.

The seed sown in the month of Koowar (October) during the Swatee Nakshatr, yields a good crop and of best quality, 25, 30, or 35 seers of wheat are sown on a bigha.

In eight days it sprouts, and exactly after five months the crop is reaped. A bigha yields from 2 to 6 maunds.

If the rain happens to fall when the crop has risen a little above the surface of the ground, the outturn is exceedingly good; but if the weather remains cloudy and cold, the crop gets blasted, the ear is small, and the grain light. If the rain falls copiously during the monsoon, manure is not needed.

The irrigated fields of wheat are similarly prepared and manured, as those of opium. Mukka is sown during the rainy season, and wheat, when it is over.

The wheat fields are twice or thrice irrigated. If the crop is not injured by the cold or damp, &c., an outturn, varying from 6 to 18 maunds, is reaped. It is necessary that the irrigated fields should be manured.

The outturn depends much on the nature of the soil.

The land of good quality produces wheat continuously for ten years; that of inferior description for five years, when either jowari or some other grain is sown, or it is to be left quite untilled for a time.

There are some lands on which no corn but wheat is grown.

The wheat that grows in the land newly brought under cultivation is of a good quality.

Unirrigated land, if manured, will also produce good corn like the irrigated fields, and it is for this reason that the cultivators ask the Bunjaras to stay with their bullocks, &c., in the irfields.

Abstract Translation of a Report of Vakil of Dewas, Junior Branch, on the subject of the Production of Wheat, dated 9th December 1881.

WHEAT generally grows either in black or brown soil, and it is of white and red colours.

The method of the preparation of the soil before cultivation is as follows:

The ground is twice harrowed in the month of Baisakh (May) and once in Asarh (July) and Sawan (August); subsequently, in the

month of Bhadon (September), it is ploughed. The ploughing operation is again gone through twice in the month of Koowar (October), when wheat is sown.

The Malwa soil produces wheat without manure and irrigation.

There are here and there some fields which are irrigated. Such fields are often manured and yield a large outturn. The manured and irrigated land yields from 9 to 12 maunds (that is, a manee) and the unirrigated land yields from 4 to 6 maunds.*

* A seer is = Rs. 80.
Maund „ = seers 20.
Manee „ = 12 maunds.

If wheat is sown every year, the productive power is weakened and the land does not yield according to the rate above specified; but if wheat is sown alternately with other grain—say after one or two years' interval—the above rate of production is kept up.

If the ground is left untilled for five or ten years, and then after sowing gram at first the wheat is sown, the quantity of outturn doubles; but only for a year or two could wheat be produced in such large quantity. During the interval gram or jowar is sown.

It is difficult to make any comparison between the outturn of former and present times, for much depends on the labour of the cultivators. The same soil, if cultivated well, yields a first rate crop, but if badly tilled produces little.

Abstract Translation of a Report of the Vakil of Bagli Thakur, on the Subject of Production of Indian Wheat,—dated 16th October 1881.

THERE are two kinds of soil on which wheat is grown, *viz.*—

1st.—Black soil, which goes down to a depth of some 3 feet and is free of stones, &c.

2nd.—Bhurmut soil.

The method of cultivation is as follows:—

In the months of May and June the ground is ploughed twice; this breaks up the soil, clears it of weeds, and allows the sun to get at the subsoil. After the rains, in July and August, it is again ploughed twice,—firstly from east to west, and then from south to north. Result—more weeds are rooted up and destroyed, &c.

From the end of September to October, when the rains are well over, the land is again ploughed twice, and again once more when the wheat is sown.

In 1 bigha of land 25 seers of corn are sown.

If the above method is followed, a large crop and a good grain is produced, but if, instead of ploughing the ground twice, it is only ploughed once, in each case the crop is small and of inferior quality.

In this part of the country the crops are not irrigated, but depend on the rainfall alone. If the December rains fall in fair abundance the crops are greatly improved.

If the fields are manured, the crops are improved to the extent of 2 per cent.

The production of corn from 1 bigha of land, sown with 25 seer of grain, is from 3 to 6 maunds, as a rule, (at 40 seers, to 1 maund).

There are 2 sorts of corn,—(1) white corn, or Jalalia; (2) red corn, or Koata; but there is not much difference in quality between these two.

The system of rotation of crops is practised thus: one year of chenna, next four years wheat; then the sixth year some other grain, and next four years wheat; and so on.

In the opinion of old cultivators the soil is not now capable of producing quite as much as in former days.

No. 8801, dated Baroda, the 25th October 1882.

From—Major-General J. Watson, V.C., C.B., Agent to the Governor General at Baroda,

To—The Secretary to the Government of India, Foreign Department.

In reply to your letter No. 768 I.G., dated 29th June 1881, I have now the honour to forward a copy of a letter, No. 989, dated the 25th ultimo, from the Minister of the Baroda State, in which he gives such information as is available regarding wheat cultivation in Baroda territory.

No. 989, dated Baroda, the 25th September 1882.

From—T. Madava Row, Dewan,

To—The Agent to the Governor General, Baroda.

With reference to Mr. Melvill's letter, marginally noted, on the subject of wheat grown in Baroda territory, I have the honour to state that wheat is not grown in the State extensively, and that, though all, or some, of the varieties of wheat *viz.*, soft white, hard white, soft red, and hard red—are grown in different parts of this State, the best variety is inferior to that grown in Malwa, and, therefore, much of the wheat which is consumed by the richer classes of people is imported.

No. 5495, dated 8th July 1881.

2. The better classes of wheat are grown in light loamy soils, and to some extent also grown in black soil.

3. The system of cultivation followed is that which prevails generally in Gujrat. Wheat is either sown after the rain crops have been gathered in, or it is raised as the sole crop of the season. When it follows another crop, the outturn is smaller. Wheat grown in rice fields as a second crop and also that grown in black soil usually requires no irrigation, as these lands retain sufficient moisture for its growth, if the monsoon rains have been sufficiently copious. If otherwise, some artificial irrigation is necessary. With light soils, however, the case is different. Wheat is raised in them by means of irrigation.

4. The best kind of wheat is raised on light soils. These soils, as a rule, are better manured than black soil. As is well known, the principal manure used is cowdung, mixed with house-sweepings and cattle-litter.

5. There are so many circumstances on which the yield of wheat per acre depends that it is difficult to estimate the average yield. It is, however, believed to be 15 maunds.*

* Of 40 lbs. each.

6. There are no reliable data showing that the productive power of the soil in these territories has begun to fail.

Endorsement by the Foreign Department,—No. 1174 I., dated Simla, the 7th November 1882.

TRANSFERRED to the Revenue and Agricultural Department for disposal, in continuation of the office memorandum from this office, No. 294 I.G., dated the 17th February 1882.

No. 2341-427, dated Bangalore, the 22nd January 1883.

From—SIR JAMES GORDON, K.C.S.I., Resident in Mysore,

To—The Secretary to the Government of India, Foreign Department.

WITH reference to your letter No. 768 I.G., dated 29th June 1881, forwarding copies of a communication from the Home, Revenue, and Agricultural Department, No. 7—153-165, of the 14th May 1881, and calling for certain information in regard to wheat and its cultivation in this province, I have the honour to forward herewith copy of a letter * from the Mysore Durbar, intimating that all the particulars available on the subject in question were given in the marginally noted letter † addressed by the late Chief Commissioner of Mysore to the Government of India, a copy of which, with the statements annexed, is enclosed for ready reference.

* No. 52, dated 12th January 1883.

† No. 1729—21, dated 6th June 1878.

No. 52, dated Bangalore, the 12th January 1883.

From—R. VIJAYINDRA RAO, for Dewan of Mysore,

To—The Assistant Resident in Mysore, Bangalore.

IN reply to your letter No. 793, dated 14th July 1881, calling for a report on the wheat cultivation in the province, I have the honour to solicit the attention of the Resident to the letter‡ No. 1729—21, of the 6th June 1878 addressed by the Secretary to the late Chief Commissioner, to the Secretary to the Government of India, Department of Revenue and Agriculture in reply to their reference.

All the available information now called for in Government Resolution No. 7—153, of the 14th May 1881, is given in full detail in the said letter and the extract from the Mysore Gazetteer quoted in it.

‡ Published at pages 49—60 of the Selections from the Records of the Government of India, Home, Revenue, and Agricultural Department, No. CLX.

No. 1729—21 R., dated Bangalore, the 4th June 1878.

From—MAJOR T. G. CLARKE, Secretary to the Chief Commissioner of Mysore,

To—The Secretary to the Government of India, Department of Revenue, Agriculture and Commerce

IN continuation of this office letter No. 795—12, dated 3rd ultimo and previous correspondence, I am desired by the Chief Commissioner

to submit the following report on the cultivation of wheat in Mysore, as called for in Government of India Resolution No. 1—47, dated 14th March 1877.

2. The cultivation of wheat is carried on in nearly every district of the province, but the Chitaldroog district is that in which the cereal is most largely produced. In the Kadur district, wheat is chiefly raised in the taluks of Banawar, Tarikeri, and Chickmaglur. In the Shimoga district it is grown to a large extent in the Honnali taluk, and to a limited extent in the Shikarpur and Chennagiri taluks. In the Mysore district its cultivation is restricted to the taluks of Munjungud, Chamrajnagar, Gundlapet, and Talkad; and in the Hassan district to the taluks of Hassan, Arkalgud, Channaroypatna, Harnhully, and Nursipur. In the Bangalore and Tumkur districts, wheat is grown in very few localities, while in the Kolar district it is cultivated in eight out of the eleven taluks,—*viz.*, Kolar, Betmangala, Shrinivaspur, Mulbagal, Sidlagatta, Malur, Gumnayakanpalya, and Goribidnur.

(1) The names of the districts in which wheat is grown.

3. The area cultivated with wheat in each of the last five years and the average outturn per acre are shown in the appended statement.

(2) The area (in acres) under wheat in each of the last 5 years to the end of 1876-77.

4. It will be seen from the Statement No. I that there has been a large decrease in the area under wheat cultivation during the last two years, owing apparently to the unfavourable season, the extent cultivated in 1876-77 being less than half of that cultivated in 1874-75.

(3) the average outturn in lbs. per acre.

5. The information required under this head will be found at paras. 99 to 101 of the Mysore Gazetteer, Volume I. A copy of the passage is appended to this letter.

6. The appended statement No. II shows the average quantity of wheat sold per rupee during the last six years.

(4) A brief account of the cultivation, in which should be stated the kind of land preferred, the quantity of seed sown per acre, the crop which wheat follows, the season of cultivation, and other useful particulars.

7. The high prices obtained for wheat in 1876-77 and 1877-78, as shown in the foregoing statement, were owing to the prevailing famine.

8. The total consumption of wheat within each district and the average consumption per head of the population are shown in the appended Statement No. III.

(5) The average wholesale price of wheat,

(6) the average consumption per head of the population of the district, and

(7) the total consumption within the district.

9. The total population of the province according to the census of 1871 is 5,055,412 (now very greatly reduced), which, contrasted with the total consumption of wheat, amounting to 5,649,946 lbs., gives an average of 1 lb. 1 oz. per head. The average would, as the population now stands, be higher. If the consumption of this article by the European communities of the large towns be excluded, this average would necessarily be much reduced.

10. Wheat is not consumed to a large extent by the natives of this province, who generally use it as an article of luxury on special occasions, such as marriages, festivals, and other entertainments. In the

town of Bangalore, where wheat is consumed to a large extent by the European community, the average consumption is estimated at 20 lbs. per head.

(8) Annual imports into the district for 5 years, and places whence imported.

11. The total quantity of wheat imported into the province during the last five years amounted to 24,952,820lbs., or an average of 4,990,564 lbs. per annum, as shown in the appended Statement No. IV.

(9) Annual exports for the same period, places whither exported, and proportion carried by road, rail, or river.

12. There were no exports except from Chitaldroog and Kolar Districts, and to a small extent from the Tumkur District. The total quantity of wheat exported during the past five years amounted to 7,029,600 lbs., or an average of 1,405,920 lbs. per annum, as exhibited in the appended Statement No. V.

(10) The estimated average cost of cartage to the railway station nearest the province.

13. The ordinary rates of cart-hire to the Bangalore terminus of the Madras Railway from the several district head-quarters are shown under—

(11) Cost of transit to port of shipment (Calcutta, Bombay, or Kurrachee) by rail, by road, and by river.

District head-quarters.	Distance to Bangalore.	Rate per mile.	Amount. Rs. A. P.
Tumkur	43 miles.	1¼ annas.	4 0 6
Shimoga	171 „		16 0 6
Chickmaglur	150 „		14 1 6
Chitaldroog	123 „		11 8 6
Hassan	115 „		10 12 6
Mysore	87 „		8 2 6
Kolar	43 „		4 0 6

14. The principal port from which wheat can be exported is Madras which is distant 216 miles by rail. The charge for conveyance of grain by the Madras Railway is 6 pies per ton per mile.

(12) Local names for the varieties of wheat cultivated and their description in English.

15. There are two kinds of wheat cultivated in Mysore, *viz.*, "Hoti Godhi" (*Triticum spelta*) and "Jave Godhi" (*Triticum monococcum*). The latter grain is considered to be of the superior quality.

16. The samples of wheat grown in the various taluks which have already been submitted to the Government of India from time to time are noted in the accompanying statement, which also embodies the opinion of the Superintendent of the Government Experimental Farm as to the character of each sample.

17. The opinion of the Agent to the Bakery (recently established at Bangalore by a Mr. McGregor of Dundee) as to the character and value of two of the locally-grown samples which were submitted for his inspection is as follows: "I beg to remark that the sample marked 'Jave Godhi,' grown in the Narsipur Taluq, Hassan District, is exceedingly well adapted for the purpose of bread manufacture, though not so large in the bulk of grain as the wheat from Sholapur and Dharwar, which are considered very superior kinds, yet judging from its firmness and apparent solidity, I have no hesitation in saying that this wheat would compare very favourably, indeed, in any experiments that might be made in making bread from the same quantity of either kind. I would, however, remark that the specimen wheat is not cleaned sufficiently as a marketable commodity. The other specimen marked 'Hotte Godhi' would never

become popular as a bread wheat. The colour is not only against it, but it appears to be wanting in that softness which is the main attribute of the other and of all good bread wheats."

(13) A general summary for the province showing the total area under wheat, the average outturn, and the details of the import and export trade.

18. The total area cultivated with wheat during the past five years amounted to 55,699 acres, which yielded 16,174,492 lbs., or an average of 290¼ lbs. per acre. The total quantity imported during the same period was 11,139 tons 13 cwt. 4 lbs., and that exported was 3,138 tons 4 cwt. 32 lbs.

Districts.	Area in acres.						Average outturn in lbs. per acre.	Total outturn in lbs.	Remarks.
	1872-73.	1873-74.	1874-75.	1875-76.	1876-77.	Total.			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
Chitaldroog	7,172	6,799	7,404	4,960	1,168	27,503	193	5,308,079	The average outturn per acre in the various taluks during the past five years is stated to vary from 10 to 320 lbs.
Shimoga	970	960	954	965	963	4,812	450	2,165,400	
Kadur	2,550	2,600	2,500	2,000	2,000	11,650	54	629,100	The Kadur Deputy Commissioner states that these figures are taken from the statistical returns, but, according to special information called for, the average area cultivated annually was only 559 acres and the average outturn per acre varied from 64 to 600 lbs.
Bangalore	300	300	300	300	300	1,500	2,700	4,050,000	The Deputy Commissioner of Bangalore has only given the total area cultivated during the past five years, and not the actual area, cultivated in each year.
Kolar	248	278	293	124	80	1,023	1,600	1,636,800	The Kolar Deputy Commissioner states that in the Mulbagal, Kualur, Betruangala, and Goribidnur taluks, where the soil is inferior only 800 lbs. may be taken as the average outturn per acre, though it is to be added that in the Goribidnur taluk, owing to the sandy character of the lands, any figure above 600 lbs. is very seldom, if at all, reached.
Tumkur	120	120	120	120	120	600	1,800	1,080,000	The Tumkur Deputy Commissioner states that the cultivation of wheat is but little followed in his district, the whole area so cultivated not exceeding 120 acres during the last five years ending 1876-77.
Mysore	1,123	1,559	1,893	1,689	1,644	7,908	144	1,120,224	The average outturn during the past five years varied from 130 to 192 lbs. per acre.
Hassan	74	174	189	242	24	703	283	1,84,889	The average outturn in the various taluks is said to vary from 400 to 40 lbs. per acre, the ordinary yield being from 200 to 240 lbs.
Total . .	12,557	12,790	13,653	10,400	6,299	55,699	290½	16,174,492	

N.B.—The figures in column (9) have been calculated by multiplying those in columns (7) and (8).

II.

Prices of Wheat per Rupee.

Districts.	1872-73.	1873-74.	1874-75.	1875-76.	1876-77.	1877-78.	Remarks.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
Chitaldroog . .	23·2	24	38	24·6	12	14	Wholesale.
Shimogah . .	16	24	24	24	10·4	8·4	Retail sale.
Kadur . . .	28	20	24	18	8	12	,,
Bangalore . .	16	24·4	27	21·4	14	16·4	Wholesale.
Kolar . . .	19	...	...	...	...	17	,,
Tumkur . . .	19	25	25	24	13	18	,,
Mysore . . .	19	23	26·2	19	14·6	7	,,
Hassan . . .	18	25	21	20	12·4	12	Retail sale.

N.B.—The prices shown in this statement are those obtained in the last fortnight of each official year.

III.

Consumption of Wheat.

District. (1)	Population. (2)	Total consumption per annum within the District. (3)	Average consumption per head of the population of the District. (4)	Remarks.
		lbs.	lbs. oz.	
Chitaldroog . .	531,360	533,084	1 0	
Shimoga . . .	498,976	687,600	1 6	
Kadur . . .	333,925	229,432	0 11	
Bangalore . .	828,354	1,920,000	2 5	
Kolar . . .	618,954	215,120	0 $5\frac{1}{2}$	
Tumkur . . .	632,239	554,100	0 14	
Mysore . . .	943,187	1,247,232	1 5	
Hassan . . .	668,417	263,378	0 6	
TOTAL .	5,055,412	5,649,946	1 1	

N.B.—The figures in column (4) have been calculated by dividing the figures in column (3) by those in column (2).

IV.

Imports.

District.	1872-73.	1873-74.	1874-75.	1875-76.	1876-77.	Total.	Places whence imported.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
Chitaldroog	1,972,960	1,610,000	1,588,200	815,800	710,400	6,697,360	From districts within the province 3,90,000 „ foreign districts 63,07,360 66,97,360
Shimogah	Details not given					2,518,880	Harihar, Kadur, and Ajinupur in Mysore, and Rani Benner and Tuamuanagatti in the Dharwar Districts (Bombay).
Kadur	141,800	107,880	104,300	113,680	50,400	518,060	Shimogah and Chitaldroog Districts of Mysore and Dharwar Collectorate of the Bombay Presidency.
Bangalore	1,319,040	773,760	2,050,240	1,028,800	1,890,560	7,062,400	Chitaldroog and Bellary Districts, and, to a small extent, from Goribidnur taluk of the Kolar District.
Kolar	157,760	157,480	165,480	182,040	182,640	845,400	From taluks within the district . 34,920 „ other districts within the province 404,720 „ Her Majesty's Territory 405,760 845,400
Tumkur	Details not given					762,560	Chitaldroog and Bangalore Districts, and parts of the Bellary Collectorate.
Mysore	1,120,000	1,151,360	1,086,400	958,720	799,680	5,116,160	Bellary and Bangalore.
Hassan	247,200	241,200	231,200	239,200	173,200	1,132,000	Tiptur, Davengeri, Chickmaglur, Bellary, &c.
				TOTAL . . .		24,952,820	
				Average per annum . . .		4,990,564	

V.

Exports.

Districts.	1872-73.	1873-74.	1874-75.	1875-76.	1876-77.	Total.	Places whither exported.	
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		lbs.
Chitaldroog . .	1,750,000	283,000	1,720,000	2,020,000	1,110,000	6,883,000	To other districts in the province	6,523,000
							To foreign districts	360,000
								6,883,000
Kolar . . .	27,000	27,000	27,840	24,000	24,000	130,600	To other taluks in the district	30,000
							To other districts in the province	70,000
							To foreign districts	30,000
								130,600
Tumkur . . .	...	...	Details not given.			16,000	From Sira taluk towards Bangalore.	
					Total .	7,029,600		
					Average per annum.	1,405,920		

VI.

Statement showing the Samples of Wheat grown in the various Taluks of the Mysore Province which were submitted to the Government in accordance with the instructions in their Resolution No. 1—47, dated 14th March 1877.

Division.	District.	Taluk.	Packet No.	Kind of wheat.	Remarks as to the character of each sample by the Superintendent of the Government Experimental Farm, Bangalore.
Nundidroog	Kolar District	Kolar	1	Jave Godhi	Hard bright grain of excellent quality, fairly grown.
,,	,,	Betmangala	2	,,	Hard, small, uniform, well filled, well grown.
,,	,,	Mulbagal	3	,,	Hard, badly grown, grains not well filled.
,,	,,	Malur	4	,,	Hard, fairly grown.
,,	,,	Sidlagatta	5	,,	Hard, well grown.
,,	,,	Goribidnar	6	,,	Hard, badly grown, grains not well filled.
,,	,,	,,	7	Hotte Godhi	Hard, fairly grown, opaque.
,,	,,	Gunmaya Kampaylya	8	Jave Godhi	Hard, very well grown, well filled.
,,	,,	,,	9	,,	Hard, well grown, well filled.
,,	Bangalore	.....	10	Hotte Godhi	Hard, well grown, dark colour, dirty sample, opaque, less flinty.
Nagar	Kadur District	Tarikeri	3	Jave Godhi	Softer and less flinty than the Jave Godhi variety.
,,	,,	,,	4	Hotte Godhi	,, ,, ,, ,,
,,	,,	Chickmaghur	6	Jave Godhi	Flinty, fine clean sample, well grown.
,,	,,	Banawat	14	,,	In husk, new sample; clean, long, thin grain.
,,	Shimogah	Chemagiri	2	,,	Good sample, small grain, clean and well grown, hard.
,,	,,	Honnali	1	Hotte Godhi	Good quality, clean, plump and well grown.
,,	Chitaldroog	Hiriur	7	,,	Fair sample, well grown, clean, well cleaned, dark skin.
,,	,,	Chitaldroog	9	Jave Godhi	Fine grain, well-prepared sample.
,,	,,	Hosdrug	8	Hotte Godhi	
,,	,,	Powghur	12	Jave Godhi	
,,	,,	Chitaldroog	13	Hotte Godhi	
Ashtagram	Hassan	Nursipur	1	Jave Godhi	Badly cleaned, broken sample, of a highly flinty character.
,,	,,	Aculgode	2	,,	Excellent sample, small grain, unhusked, translucent.
,,	Mysore	,,	1	Hotte Godhi	
,,	,,	Talkad (in Moogoor village).	2	Jave Godhi	

Endorsement by the FOREIGN DEPARTMENT,—No. 272 I., dated 3rd February 1883.

TRANSFERRED to the Revenue and Agricultural Department for disposal, in continuation of the endorsement from this office, No. 1174 I., dated the 7th November 1882.

Government of India Central Printing Office,—No. 57 R. & A.—8-12-83.—500.

Report on Indian Wheat by McDougall Brothers.

To the SECRETARY OF STATE FOR INDIA.

My Lord,

We have the honour to report upon the Indian wheats comprised in the four lots delivered to us by your brokers, Messrs. Harris Brothers & Co., which we have operated upon according to instructions contained in your Lordship's communications to us of 8th October and 25th October 1880, and supplemented by the verbal instructions made to us (we beg to refer to these communications and to our replies of 22nd October, 26th October, and 24th November 1880). These instructions were to the effect—

I. That we should take a given quantity of each of these four representative Indian wheats, *viz.* :—

Indian, fine soft white,
„ superior soft red,
„ average hard white,
„ „ „ red,

and manufacture them into flour by the ordinary process of grinding under millstones. Also that we should take similar quantities of the same wheats and manufacture them into flour by means of crushing between rollers, according to the system known as the Hungarian or roller system.

II. That we should take a given quantity of each flour so produced and manufacture it into bread.

III. That we should note the qualities and other characteristics of the flours produced, also of the offals, *viz.*, middlings, pollard, and bran.

IV. That we should procure the following representative wheats, of fair average quality of the season, as then being sold on Mark Lane market, and, for the purpose of obtaining results for comparison, deal with them precisely as above indicated, both as regards flour, bread, and offals, *viz.* :—

English average.
American (red winter).
„ (spring).
Australian average.
Californian „

Russian, Saxonska.
„ Taganrog.
„ Kubanka.
„ Ghirka.
Egyptian, Buhi.
„ Saida.

Note.—Of the two latter qualities of Russian wheats, Kubanka and Ghirka, none was to be obtained in London or other English markets, and consequently cannot be included in this report.

These operations have all been carried out in our own mills and bakeries with due care and precision, and under the personal supervision of one of the members of our firm, during the whole period occupied until their completion.

We beg to report as follows :—

The quantity of each wheat operated upon by each system of milling was 5,000 lbs., as delivered from the ship (weight of sacks or bags not included).

The results obtained are stated in the following tables, which are followed by tabulated synopsis for convenience of ready comparison :—

WHEAT.

Lot 1.—Indian, fine soft white.

Quality—Fine soft white. (White, medium sized, skin thin, clean, and regular, free from seeds; 2 per cent. weevilled; handled exceedingly well.)

Value in London, 49*s.* per 496lbs.

Weight per bushel, 64lbs. (This weight is only equalled by specially fine samples of any weight.)

Weight of 100 separate grains of the wheat, 55·4 grains avoirdupois. (100 weevilled grains weighed only 39·69 grains avoirdupois.)

1. *System*—Grinding under millstones.

Quantity operated upon, 5,000 lbs.			
Enter quantity treated as		100·00	per cent.
Impurities removed	...	1·52	„
		98·48	„
Water absorbed to render mellow	...	2·00	„
		100·48	„

Yield: flour ...	77·46	per cent.	(A high yield, fine
„ middlings ...	·82	„	white colour, and
„ pollard ...	8·80	„	superior bloom).
„ bran ...	12·00	„	
	99·08	„	
Evaporation and loss ...	1·40	„	(See Notes, page 24).
	100·48	„	
Gluten, by water test, when damp ...	16·4	„	
Ditto, ditto, when dry ...	6·4	„	

2. *System*—Crushing between rollers.

Quantity operated upon, 5,000 lbs.

Enter quantity treated as	100·00	„	
Impurities removed ...	1·52	„	
	98·48	„	
Water absorbed to render mellow	2·00	„	
	100·48	„	
Yield: flour ...	72·2	„	(An exceedingly
„ dark ditto ...	1·9	„	high yield, fine white colour, and superior in bloom).
	74·1	„	
„ middlings ...	11·0	„	
„ pollard ...	8·7	„	
„ bran ...	4·0	„	
	97·8	„	
Evaporation and loss	2·68	„	(See Notes, page 24).
	100·48	„	
Gluten, by water test, when damp ...	20·2		
Ditto, ditto, when dry	6·8		

Lot 2.—Indian, superior soft red.

Quality.—Superior soft red. (Colour dull light brown, with about 5 per cent. white wheat; size half medium and half small; skin thin; weevil only a trace; clean and free from seed; handled well.)

Value in London, 45*s.* per 496 lbs.

Weight per bushel, 62¾ lbs. (Good.)

Weight of 100 separate grains of the wheat, 51·8 grains avoirdupois.

1. *System*—Grinding under millstones.

Quantity operated upon, 5,000 lbs.			
Enter quantity treated as		100·0 per cent.	
Impurities removed	...	·72 „	
		99·28 „	
Water absorbed to render mellow	...	3·60 „	
		102·88 „	
Yield : flour	...	78·40 „	(A high yield, colour medium).
„ middlings	...	1·68 „	
„ pollard	...	9·80 „	
„ bran	...	9·40 „	
		99·28 „	
Evaporation and loss	...	3·60 „	(See Notes, page 24).
		102·88 „	
Gluten, by water test, when damp	...	24·6 „	
Ditto, ditto, when dry	...	9·3 „	

2. *System*—Crushing between rollers.

Quantity operated upon, 5,000 lbs.			
Enter quantity treated as		100·0 per cent.	
Impurities removed	...	·72 „	
		99·28 „	
Water absorbed to render mellow	...	3·60 „	
		102·88 „	

Yield : flour	...	74·2	per cent.	(A high yield,
„ dark ditto	...	1·2	„	colour good and with bloom).
		75·4	„	
„ middlings	...	7·7	„	
„ pollard	...	13·5	„	
„ bran	...	5·3	„	
		101·9	„	
Evaporation and loss	...	·98	„	(See Notes, page 24).
		102·88	„	
Gluten, by water test, when damp	...	23·4	„	
Ditto, ditto, when dry		10·5	„	

Lot 3.—Indian, average hard white.

Quality—Average hard white. (Colour light yellow, and semi-transparent, with a little hard red ; size long and arched ; skin thin ; wheat clean, but about 3 per cent. of dry hard mud in large pieces ; weevil only a trace.)

Value in London, 44*s.* per 496lbs.

Weight per bushel, 60lbs.

Weight of 100 separate grains of the wheat, 68·3 grains avoirdupois.

1. *System*—Grinding under millstones.

Quantity operated upon, 5,000 lbs.

Enter quantity treated as 100·0 per cent.

Impurities removed	...	3·7	„	(Contained an excess of dry earth or mud).
		96·3	„	
Water absorbed to render mellow ...	...	8·4	„	(Very high).
		104·7	„	
Yield : flour	...	80·52	„	
„ middlings	...	·78	„	
„ pollard	...	10·0	„	
„ bran	...	8·3	„	
		99·60	„	

Evaporation and loss ...	5·1 per cent.	(See Notes, page 24).
	104·7 „	
Gluten, by water test, when damp ...	31·4 „	
Ditto, ditto, when dry	11·7 „	

2. *System*—Crushing between rollers.
Quantity operated upon, 5,000 lbs.

Enter quantity treated as	100·0 per cent	
Impurities removed ...	3·7 „	
...	96·3 „	
Water absorbed to render mellow ...	8·4 „	(Very high).
	104·7 „	
Yield : flour ...	72·1 „	(A high yield,
„ dark ditto ...	1·1 „	colour medium, and good bloom).
	73·2 „	
„ middlings ...	10·3 „	
„ pollard ...	14·3 „	
„ bran ...	3·1 „	
	100·9 „	
Evaporation and loss ...	3·8 „	(See Notes, page 24).
	104·7 „	
Gluten, by water test, when damp ...	33·2 „	
Ditto, ditto, when dry	12·6 „	

Lot 4.—Indian, average hard red.

Quality—Average hard red. (Colour very dull brown, semi-transparent, with 10 per cent. fine soft white, large coarse grains, arched and pointed.)

Value in London, 43*s.* per 496lbs.

Weight per bushel, 61¼lbs. (Condition clean and free from dirt, but a little grain, seed, and linseed and barley; free from weevil.)

Weight of 100 separate grains of the wheat, 77·7 grains avoirdupois.

1. *System*—Grinding under millstones.
Quantity operated upon, 5,000 lbs.

Enter quantity treated as		100·0	per cent.
Impurities removed	...	1·2	„
		98·8	„
Water absorbed to render mellow ...	...	7·6	„
		106·4	„
Yield: flour	...	79·88	„ (An exceedingly high yield; colour inferior).
„ middlings	...	·78	„
„ pollard	...	13·20	„
„ bran	...	8·50	„
		102·36	„
Evaporation and loss	...	4·04	„ (See Notes, page 24).
		106·4	„
Gluten, by water test, when damp	...	40·4	„
Ditto, ditto, when dry		13·4	„

2. *System*—Crushing between rollers.
Quantity operated upon, 5,000 lbs.

Enter quantity treated as		100·0	per cent.
Impurities removed	...	1·2	„
		98·8	„
Water absorbed to render mellow	...	7·6	„ (Very high).
		106·4	„
Yield: flour	...	72·3	„ (A high yield; colour inferior).
„ dark ditto	...	1·9	„
		74·2	„

Yield : middlings ...	10·3	per cent.	
„ pollard	13·8	„	
„ bran	3·0	„	
	101·3	„	
Evaporation and loss ...	5·1	„	(See Notes, page 24).
	106·4	„	
Gluten, by water test, when damp	41·6	„	
Ditto, ditto, when dry ...	13·1	„	

Lot 5.—English.

Quality—English. (Colour, average red ; skin thick and heavy; clean, tough from unfavourable season.)

Value in London, 49*s.* per 496lbs.

Wheat per bushel, 60½lbs. (This wheat in dry season would weigh 63lbs.)

Weight of 100 separate grains of the wheat, 574 grains avoirdupois.

1. *System*—Grinding under millstones.

Quantity operated upon, 5,000 lbs.

Enter quantity treated as	100·0	per cent.	
Impurities removed ...	1·5	„	
	98·5	„	
Water absorbed to render mellow; none required.			(Already contained some excess of moisture.
Yield : flour ...	65·2	„	Would have worked better if mixed with a dry wheat.)
„ middlings ...	1·1	„	(This low percentage owing to dampness of the wheat, and consequent thickness of skin. Colour good, but not up to average in bloom.)
„ pollard ...	9·7	„	

Yield : bran	...	17·7 per cent.	(Exceedingly high from toughness of wheat ; did not clean well.)
		93·7 „	
Evaporation and loss	...	4·8 „	(Evaporation was high from damp condition of wheat. See Notes, page 24).
		98·5 „	
Gluten, by water test, when damp	...	32·8 „	
Ditto, ditto, when dry	...	10·6 „	

2. *System*—Crushing between rollers.

Quantity operated upon, 5,000 lbs.

Enter quantity treated as		100·0 per cent.	
Impurities removed	...	1·5 „	
		98·5 „	
Water absorbed to render mellow, none.			
Yield : flour	...	67·8	
„ dark	...	2·5	
		70·3 per cent.	
„ middlings	...	7·6 „	
„ pollard	...	7·2 „	
„ bran	...	9·2 „	(The same remarks apply here as above).
		94·3 „	
Evaporation and loss		4·2 „	(See Notes, page 24).
		98·5 „	
Gluten, by water test, when damp		34·2 „	
Ditto, ditto, when dry	...	11·4 „	

Lot 6.—Australian.

Quality—Australian. (Skin medium thickness; short plump grain, with an admixture of about 1 per cent. black oats, straw, and chaff.)

Value in London, 50*s.* 6*d.* per 496lbs.

Weight per bushel, 62½lbs.

Weight of 100 separate grains of the wheat, 80·5 grains avoirdupois. (Highest weight of any of the grains of wheat.)

1. *System*—Grinding under millstones.

Quantity operated upon, 5,000 lbs.

Enter quantity treated as		100·0 per cent.	
Impurities removed		1·0	,,
		99·0	,,
Water absorbed to render mellow, none.			
Yield : flour	...	75·8	,,
,, middlings	...	1·1	,,
,, pollard	...	7·4	,,
,, bran	...	14·4	,,
		98·7	,,
Evaporation and loss		·3	,,
		99·0	,,
Gluten, by water test, when damp	...	40·8	,,
Ditto, ditto, when dry	...	11·6	,,

(A good yield, superior white colour and bloom).

(See Notes, page 24).

2. *System*—Crushing between rollers.

Quantity operated upon, 5,000 lbs.

Enter quantity treated as			100·0 per cent.	
Impurities removed	...		1·0	,,
			99·0	,,
Water absorbed to render mellow, none.				
Yield : flour	...	73·8		
,, dark	...	1·3		
			75·1 per cent.	
,, middlings		...	8·0	,,
,, pollard ...		...	9·3	,,
,, bran		...	5·5	,,
			97·9	
Evaporation and loss		...	1·1	
			99·0	,,

(A high yield, colour and bloom superior).

(See Notes, page 24).

Gluten, by water test, when damp ... ... 37·4 per cent.
Ditto, ditto, when dry ... 12·2 „

Lot 7.—New Zealand.

Quality—New Zealand. (Short, plump, and regular white grains, in very good and clean condition; skin medium thickness.

Value in London, 48*s.* per 496lbs.

Weight per bushel, 62¾lbs.

Weight of 100 separate grains of the wheat, 67·6 grains avoirdupois.

1. *System*—Grinding under millstones.

Quantity operated upon, 5,000lbs.

Enter quantity treated as		100·0 per cent.	
Impurities removed	...	·3 „	
		99·7 „	
Water absorbed to render mellow; none required.			
Yield: flour	...	76·1 „	(A high yield,
„ middlings	...	·96 „	superior white
„ pollard	...	8·8 „	colour).
„ bran	...	11·5 „	
		97·36 „	
Evaporation ...	...	2·34 „	(See Notes, page 24).
		99·7 „	
Gluten, by water test, when damp	...	31·0 „	
Ditto, ditto, when dry	...	10·2 „	

2. *System*—Crushing between rollers.

Quantity operated upon, 5,000 lbs.

Enter quantity treated as		100·0 per cent.	
Impurities removed	...	·3 „	
		99·7 „	

Water absorbed to render mellow; none required.				
Yield: flour ...	73·9			
„ dark ...	2·2			
		76·1	per cent.	(A high yield,
„ middlings ...		7·8	„	superior white colour and bloom).
„ pollard ...		6·6	„	
„ bran ...		5·6	„	
		96·1		
Evaporation and loss ...		3·6	„	(See Notes, page 24).
		99·7	„	
Gluten, by water test, when damp		26·6	„	
Ditto, ditto, when dry ...		9·0	„	

Lot 8.—Californian.

Quality—Californian. (White and irregular grains; skin rather tough; some barley and oats; condition good.)

Value in Liverpool, 48*s.* per 496lbs.

Weight per bushel, 59¼ lbs.

Weight of 100 separate grains of the wheat, 47·7 grains avoirdupois.

1. *System*—Grinding under millstones.

Quantity operated upon, 5,000lbs.

Enter quantity treated as	100·0	per cent.	
Impurities removed ...	1·7	„	
	98·3	„	
Water absorbed to render mellow, none.			
Yield: flour ...	71·1	„	(Medium yield,
„ middlings ...	·72	„	colour and
„ pollard ...	9·2	„	bloom exceptionally good).

Yield : bran ...		15·3 per cent.	(A high yield).
		96·32 „	
Evaporation and loss ...		1·98 „	(See Notes, page 24).
		98·3 „	
Gluten, by water test, when damp ...		32·2 „	
Ditto, ditto, when dry ...		10·5 „	

2. *System*—Crushing between rollers.

Quantity operated upon, 5,000 lbs.

Enter quantity treated as		100·0 per cent.	
Impurities removed ...		1·7 „	
		98·3 „	
Water absorbed to render mellow, none.			
Yield : flour ...	68·8		Medium yield, colour, and bloom exceptionally good).
„ dark ...	1·3		
		70·1 „	
„ middlings ...		14·5 „	(A high yield).
„ pollard ...		6·3 „	
„ bran ...		3·9 „	
		94·8 „	
Evaporation and loss ...		3·5 „	(See Notes, page 24).
		98·3 „	
Gluten, by water test, when damp ...		29·6 „	
Ditto, ditto, when dry ...		8·7 „	

Lot 9.—American winter.

Quality—American winter. Colour red; grains clean; skin rather thick, but irregular in size; condition good.

Value in London, 49*s.* 6*d.* per 496lbs.

Weight per bushel, 61¾lbs.
Weight of 100 grains of the wheat, 49·6 grains avoirdupois.

1. *System*—Grinding under millstones.

Quantity operated upon, 5,000lbs.

Enter quantity treated as		100·0 per cent.	
Impurities removed	...	·5 „	
		99·5 „	
Water absorbed to render mellow; none required.			
Yield : flour	...	73·8 per cent.	(A medium yield, colour fine).
„ middlings	...	·38 „	
„ pollard	...	7·9 „	
„ bran	...	16·4 „	(A high yield).
		98·48 „	
Evaporation and loss	...	1·02 „	(See Notes, page 24).
		99·5 „	
Gluten, by water test, when damp	...	37·0 „	
Ditto, ditto, when dry	...	11·0 „	

2. *System*—Crushing between rollers.

Quantity operated upon, 5,000 lbs.

Enter quantity treated as		100·0 per cent.	
Impurities removed	...	·5 „	
		99·5 „	
Water absorbed to render mellow, none.			
Yield : flour	...	70·8 „	(A medium yield, colour and bloom very fine).
„ dark	...	·7 „	
		71·5 „	
„ middlings	...	10·3 „	
„ pollard	...	11·2 „	
„ bran	...	3·1 „	
		96·1 „	

Evaporation and loss ...	3·4 per cent.		(See Notes, page 24).
	99·5 „		
Gluten, by water test, when damp ...	39·4 „		
Ditto, ditto, when dry ...	11·7 „		

Lot 10.—American spring.

Quality—American spring. (Small red grains; skin rather thick; some oats, with about 2 per cent. cockle and buckwheat.)

Value in London, 48*s.* per 496lbs.

Weight per bushel, 61lbs.

Weight of 100 separate grains of the wheat, 35·5 grains avoirdupois.

1. *System*—Grinding under millstones.

Quantity operated upon, 5,000 lbs.

Enter quantity treated as	100·0 per cent.		
Impurities removed ...	·9 „		
	99·1		
Water absorbed to render mellow; none required.			
Yield: flour ...	72·2 per cent.		(Medium yield,
„ middlings ...	·24 „		colour and
„ pollard ...	7·2 „		bloom excep-
„ bran	14·7 „		tionally good).
	94·34 „		
Evaporation and loss ...	4·76 „		(See Notes, page 24).
	99·1 „		
Gluten, by water test, when damp ...	40·6 „		(Strength above
Ditto, ditto, when dry ...	15·3 „		average).

2. *System*—Crushing between rollers.

Quantity operated upon, 5,000 lbs.

Enter quantity treated as	100·0	per cent.	
Impurities removed ...	·9	„	
	99·1	„	
Water absorbed to render mellow; none required.			
Yield: flour ...	68·7	„	
„ dark ...	·8	„	
	69·5	„	
„ middlings ...	12·1	„	(Medium yield, colour and bloom exceptionally good).
„ pollard ...	10·4	„	
„ bran ...	3·8	„	
	95·8	„	
Evaporation and loss ...	3·3	„	(See Notes, page 24).
	99·1	„	
Gluten, by water test, when damp ...	39·2	„	(Strength above average).
Ditto, ditto, when dry ...	14·6	„	

Lot 11.—Russian, Saxonska.

Quality—Saxonska. (Long, red, transparent grain; skin medium thickness; some cockle and oats; few of the smallest grains unsound, otherwise good condition to work.)

Weight per bushel, 60½lbs.

Value in London, 52*s.* per 496 lbs.

Weight of 100 separate grains of the wheat, 37·3 grains avoirdupois.

1. *System*—Grinding under millstones.

Quantity operated upon, 5,000lbs.

Enter quantity treated as	100·0	per cent.	
Impurities removed ...	·9	„	
	99·1	„	
Water absorbed to render mellow; none required.			
Yield: flour ...	73·0	per cent.	(Medium yield, colour good, strength unequalled).
„ middlings ...	1·2	„	

Yield: pollard	...	11·6 per cent.	(High yields).
„ bran	...	12·6 „	
		98·4 „	
Evaporation and loss	...	·7 „	(See Notes, page 24).
		99·1 „	
Gluten, by water test, when damp	... ...	64·2 „	
Ditto, ditto, when dry	...	22·1 „	(Exceptionally high).

2. *System*—Crushing between rollers.

Quantity operated upon, 5,000 lbs.			
Enter quantity treated as	... ...	100·0 per cent.	
Impurities removed	...	·9 „	
		99·1	
Water absorbed to render mellow; none required.			
Yield: flour	...	70·5 per cent.	(High yield, colour good, strength quite unequalled).
„ dark ditto	...	·9 „	
		71·4 „	
„ middlings	...	12·5 „	
„ pollard	...	11·7 „	
„ bran	...	3·3 „	
		98·9	
Evaporation and loss	...	·2 „	(See Notes, page 24).
		99·1	
Gluten, by water test, when damp	... ...	71·0 „	
Ditto, ditto, when dry	...	23·2 „	(Exceptionally high).

Lot 12.—Russian, Taganrog.

Quality—Hard Taganrog. (Colour yellow; size, large long transparent grains; about 3 per cent. barley and small pieces dry mud; too hard for grinding, required damping; skin thin.)

Value in London, 49*s.* per 496lbs.

Weight per bushel, 61¼lbs.

Weight of 100 separate grains of the wheat, 54·7 grains avoirdupois.

1. *System*—Grinding under millstones.

Quantity operated upon, 5,000 lbs.

Enter quantity treated as		100·0	per cent.	
Impurities removed	...	·8	„	
		99·2	„	
Water absorbed to render mellow	...	2·4	„	
		101·6	„	
Yield: flour	...	76·2	„	(Good yield; much yellow bloom; very strong).
„ middlings	...	1·2	„	
„ pollard	...	12·7	„	(Medium yield).
„ bran	...	8·1	„	
		98·2	„	
Evaporation and loss	...	3·4	„	(See Notes, page 24).
		101·6	„	
Gluten, by water test, when damp	...	51·1	„	(Very high).
Ditto, ditto, when dry	...	17·6	„	

2. *System*—Crushing between rollers.

Quantity operated upon, 5,000lbs.

Enter quantity treated as		100·0	per cent.
Impurities removed	...	·8	„
		99·2	„

Water absorbed to render mellow	...	2·4	per cent.	
		101·6	„	
Yield: flour	...	70·7	„	(Yield not as high as expected; colour with much yellow bloom).
„ dark ditto	...	1·3	„	
		72·0	„	
„ middlings	...	9·6	„	
„ pollard	...	12·1	„	(Higher than expected).
„ bran	...	5·0	„	
		98·7	„	
Evaporation and loss	...	2·9	„	(See Notes, page 24).
		101·6	„	
Gluten, by water test, when damp	...	47·0	„	(Very high).
Ditto, ditto, when dry	...	15·6	„	

Lot 13.—Egyptian, Buhi.

Quality—Buhi. (Large white and red grains; thick skin; contained 10 per cent. barley, and dry mud freely; required washing; only one degree better than the Saida wheat. See No. 14.)

Value in Liverpool, 47*s.* per 496lbs.

Weight per bushel, 58lbs.

Weight of 100 separate grains of the wheat, 50·1 grains avoirdupois.

1.—*System*—Grinding under millstones.

Quantity operated upon, 5,000lbs.			
Enter quantity treated as	...	100·0	per cent.
Impurities removed	...	2·7	„
		97·3	„
Water absorbed to render mellow	...	3·1	„
		100·4	„

Yield: flour	... 72·9	per cent.	(Medium yield, colour poor and murky, no strength, very inferior).
„ middlings	... 1·0	„	
„ pollard	... 11·0	„	} (Yield low).
„ bran	... 10·0	„	
	94·9	„	
Evaporation and loss	... 5·5	„	(See Notes, page 24).
	100·4	„	

Gluten, by water test, when damp ...	... 11·5	„
Ditto, ditto, when dry	... 4·4	„

2. *System*—Crushing between rollers.

Quantity operated upon, 5,000lbs.

Enter quantity treated as	... 100·0	per cent.	
Impurities removed	... 2·7	„	
	97·3	„	
Water absorbed to render mellow	... 3·1	„	
	100·4	„	
Yield: flour	... 70·8	„	(Medium yield, colour poor, no strength, very inferior).
„ dark ditto	... 1·8	„	
	72·6	„	
„ middlings	... 10·4	„	
„ pollard	... 8·5	„	} (Yield small).
„ bran ...	... 3·5	„	
	95·0	„	
Evaporation and loss	... 5·4	„	(See Notes, page 24).
	100·4	„	

Gluten, by water test, when damp ... ... 20·2 per cent.
Ditto, ditto, when dry ... 7·9 „

Lot 14.—Egyptian, Saida.

Quality—Saida. (Deservedly ranks as the poorest wheat in the market; medium, hard white grain, with a few darker; skin thick; some rape seed, and large quantity of small pieces of mud; required much washing before use.)

Value in Liverpool, 43*s.* 6*d.* per 496lbs.

Weight per bushel, 57½lbs.

Weight of 100 separate grains of the wheat, 61·4 grains avoirdupois.

1. *System*—Grinding under millstones.

Quantity operated upon, 5,000 lbs.				
Enter quantity treated as ... 100·0 per cent.				
Impurities removed ...		12·1	„	
		87·9	„	
Water absorbed to render mellow		2·7	„	
		90·6	„	
Yield : flour ...		66·9	„	(Yield exceptionally low, colour poor and murky; has no strength).
„ middlings ...		0·76	„	
„ pollard ...		11·4	„	
„ bran		7·5	„	(Yield low).
		86·56	„	
Evaporation and loss ...		4·04	„	(See Notes, page 24).
		90·6	„	
Gluten, by water test, when damp		22·7	„	
Ditto, ditto, when dry ...		7·5	„	

2. *System*—Crushing between rollers.

Quantity operated upon, 5,000 lbs.

Enter quantity treated as ...	100·0	per cent.	
Impurities removed ...	12·1	„	
	87·9	„	
Water absorbed to render mellow	2·7	„	
	90·6	„	
Yield : flour	66·0	„	(Yield exceptionally low, colour poor and murky; has no strength).
„ dark ditto ...	1·8	„	
	67·8	„	
„ middlings ...	7·2	„	
„ pollard ...	6·5	„	
„ bran ...	4·9	„	(Yield low).
	86·4	„	
Evaporation and loss ...	4·2	„	(See Notes, page 24).
	90·6	„	
Gluten, by water test, when damp	17·1	„	
Ditto, ditto, when dry ...	6·6	„	

SYNOPSIS and COMPARISON of Results obtained from Indian and other Wheats, by two Systems of Milling, by McDougall Brothers, at their Wheatsheaf Mills, London.

Figures in Roman.—System: Grinding under millstones. Figures in *Italics*.—System: Crushing between rollers.

No.	Wheat.	Value in London per 480lbs. net weight on day of valuation.	Weight per bushel.	Weight of 100 separate grains of the wheat.	Quantity used.	Impurities removed.	Water absorbed to render mellow.	YIELD.				Evaporation and loss.	Gluten by water test.
								Flour.	Middlings.	Pollard.	Bran.		
		s. d.	Lbs.	Grs. avdps.	Lbs.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1	Indian (fine soft white) ...	49 0	64	55·4	5,000	1·52	2·0	77·46	·82	8·8	12·0	*1·40*	6·4
	„ „ „ ...	*49 0*	*64*	*55·4*	*5,000*	*1·52*	*2·0*	*74·10*	*11·0*	*8·7*	*4·0*	*2·68*	*6·8*
2	„ (superior soft red) ...	45 0	62½	51·8	5,000	·72	3·6	78·40	1·68	9·8	9·4	*3·6*	9·3
	„ „ „ ...	*45 0*	*62½*	*51·8*	*5,000*	*·72*	*3·6*	*73·4*	*7·7*	*13·5*	*5·3*	*·98*	*10·5*
3	„ (average hard white) ...	44 0	60	68·3	5,000	3·7	8·4	80·32	·78	10·0	8·3	5·1	11·7
	„ „ „ ...	*44 0*	*60*	*68·3*	*5,000*	*3·7*	*8·4*	*73·2*	*10·3*	*14·3*	*9·1*	*3·8*	*12·6*
4	„ (average hard red) ...	43 0	61½	77·7	5,000	1·2	7·6	79·88	·78	17·20	8·50	4·04	13·4
	„ „ „ ...	*43 0*	*61½*	*77·7*	*5,000*	*1·2*	*7·6*	*74·2*	*10·3*	*15·8*	*9·0*	*5·1*	*13·1*
5	English	49 0	60½	57·4	5,000	1·5	None.	65·2	1·1	9·7	17·7	4·8	10·6
	„	*49 0*	*60½*	*57·4*	*5,000*	*1·5*	„	*70·3*	*7·6*	*7·2*	*9·2*	*4·2*	*11·4*
6	Australian	50 6	62½	80·5	5,000	1·0	„	75·8	1·1	7·4	14·4	·3	11·6
	„	*50 6*	*62½*	*80·5*	*5,000*	*1·0*	„	*75·1*	*8·0*	*9·3*	*5·5*	*1·1*	*12·9*
7	New Zealand	48 0	62½	67·6	5,000	·3	„	70·1	·96	8·8	11·5	2·34	10·2
	„ „	*48 0* (in Liverpool.)	*62½*	*67·6*	*5,000*	*·3*	„	*76·1*	*7·8*	*6·6*	*5·6*	*3·6*	*9·0*
8	Californian	48 0	59½	47·7	5,000	1·7	„	71·1	·72	9·2	15·3	1·98	10·5
	„	*48 0* (in London.)	*59½*	*47·7*	*5,000*	*1·7*	„	*70·1*	*14·5*	*6·3*	*3·9*	*3·5*	*8·7*
9	American (winter)	49 6	61½	49·6	5,000	·5	„	73·8	·38	7·9	16·4	1·02	11·0
	„ „	*49 6*	*61½*	*49·6*	*5,000*	*·5*	„	*71·5*	*10·3*	*11·2*	*5·1*	*3·4*	*11·7*
10	„ (spring)	48 0	61	35·5	5,000	·9	„	72·2	·24	7·2	14·7	4·76	15·3
	„ „	*48 0*	*61*	*35·5*	*5,000*	*·9*	„	*69·5*	*12·1*	*10·4*	*3·8*	*3·3*	*14·6*
11	Russian (Saxonska)	52 0	60½	37·3	5,000	·9	„	73·0	1·2	11·6	12·6	·7	22·1
	„ „	*52 0*	*60½*	*37·3*	*5,000*	*·9*	„	*71·4*	*12·5*	*11·7*	*3·3*	*·2*	*23·2*
12	„ (hard Taganrog) ...	49 0	61½	54·7	5,000	·8	2·4	76·2	1·2	12·7	8·1	3·4	17·6
	„ „ „	*49 0* (in Liverpool.)	*61½*	*54·7*	*5,000*	*·8*	*2·4*	*72·0*	*9·6*	*12·1*	*5·0*	*2·9*	*15·6*
13	Egyptian (Buhi)	47 0	58	50·1	5,000	2·7	3·1	72·9	1·0	11·0	10·0	5·5	4·4
	„ „	*47 0*	*58*	*50·1*	*5,000*	*2·7*	*3·1*	*72·6*	*10·4*	*8·5*	*3·5*	*5·4*	*7·9*
14	„ (Saida)	43 6	57½	61·4	5,000	12·1	2·7	66·9	·76	11·4	7·5	4·04	7·5
	„ „	*43 6*	*57½*	*61·4*	*5,000*	*12·1*	*2·7*	*67·8*	*7·2*	*6·5*	*4·9*	*4·2*	*6·6*

When the manufacture of the wheats into flour was completed, we proceeded to convert into bread a given quantity of each flour from the Indian wheats by both systems of milling, and from the remaining wheats by the roller system, and the results obtained are stated in the following tables, with a tabular synopsis for convenience of ready comparison :—

BREAD.

No. 1.—From Indian fine soft white Wheat.

1. *System*—Grinding under millstones.

Flour used	280 lbs.	
French yeast	1 „	
Liquid potato ferment ...	30 „	
Salt	3½ „	
Water used	141·4 „	
Yield of bread when cold ...	364 „	(High).
Percentage of bread to flour	130·0	(Ditto).
„ water to flour	50·5	(Ditto).

Taking 10 as standard of fair average London bread,—

Colour, exterior ...	10	
Colour, interior ...	11	
Flavour	7	
Texture	8	(Rather dense).
General characteristics ...	11	(Loaf small).

2. *System*—Crushing between rollers.

Flour used	280 lbs.	
French yeast	1 „	
Liquid potato ferment ...	30 „	
Salt	3½ „	
Water used	149·6 „	(Very high).
Yield of bread when cold ...	367·5 „	(Ditto).
Percentage of bread to flour ...	131·2	(Ditto).
„ water to flour ...	53·4	(Ditto).

Taking 10 as standard of fair average London bread,—

Colour, exterior ...	13	
Colour, interior ...	13	
Flavour	9	
Texture	9	(Rather dense).
General characteristics ...	12	(Loaf small).

No. 2.—From Indian superior soft red Wheat.

1. *System*—Grinding under millstones.

Flour used	280 lbs.	
French yeast	1 „	
Liquid potato ferment ...	30 „	
Salt	3½ „	
Water	141·6 „	(High).
Yield of bread when cold ...	372 „	(Very high).
Percentage of bread to flour ...	133·0 „	(Ditto).
„ water to flour ...	50·6	(High).

Taking 10 as standard of fair average London bread,—

Colour, exterior ...	8	
Colour, interior ...	10	
Flavour	7	
Texture	9	(Rather dense).
General characteristics ...	10	(Loaf small).

System—Crushing between rollers.

Flour used	280 lbs.	
French yeast	1 „	
Liquid potato ferment ...	30 „	
Salt	3½ „	
Water	148 „	(Very high).
Yield of bread when cold ...	362 „	(High).
Percentage of water to flour ...	52·8	(Very high).
„ bread to flour	129·3	(High).

Taking 10 as standard of fair average London bread,—

Colour, exterior ...	12	
Colour, interior ...	13	
Flavour	9	
Texture	10	(Rather dense).
General characteristics ...	11	(Loaf small).

No. 3.—From Indian average hard white Wheat.

1. *System*—Grinding under millstones.

Flour used	280 lbs.	
French yeast	1 „	
Liquid potato ferment ...	30 „	
Salt	3½ „	

Water	141·0 lbs.	(High).
Yield of bread when cold ...	370·5 „	(Very high).
Percentage of bread to flour...	132·4	(High).
Percentage of water to flour ...	50·3	(Ditto).

Taking 10 as standard of fair average London bread,—

Colour, exterior ...	6	
Colour, interior ...	7	
Flavour	7	
Texture	10	(More elastic than Nos. 1 and 2).
General characteristics ...	7	(Loaf small).

2. *System*—Crushing between rollers.

Flour used	280 lbs.	
French yeast	1 „	
Liquid potato ferment ...	30 „	
Salt	3½ „	
Water	149·6 „	(Very high).
Yield of bread when cold ...	365· „	(High).
Percentage of bread to flour ...	130·3	(Ditto).
Percentage of water to flour ...	53·4	(Very high).

Taking 10 as standard of fair average London bread,—

Colour, exterior ...	10	
Colour, interior... ...	9	
Flavour	9	
Texture	10	(More elastic than Nos. 1 and 2).
General characteristics ...	9	(Loaf small).

No. 4.—From Indian average hard red Wheat.

1. *System*—Grinding under millstones.

Flour used	280 lbs.	
French yeast	1 „	
Liquid potato ferment ...	30 „	
Salt	3½ „	
Water used	145·2 „	(High).
Yield of bread when cold ...	376·6 „	(Exceptionally high).
Percentage of bread to flour	134·5	(Ditto).
Percentage of water to flour	51·8	(High).

Taking 10 as standard of fair average London bread,—			
Colour, exterior	...	5	
Colour, interior	...	7	
Flavour	...	7	
Texture ...	...	10	(More elastic than Nos. 1 and 2).
General characteristics	...	6	

2. *System*—Crushing between rollers.

Flour used	...	280 lbs.	
French yeast	...	1 „	
Liquid potato ferment	...	30 „	
Salt	...	3½ „	
Water	...	147·4 „	(Very high).
Yield of bread when cold	...	365·0 „	(High).
Percentage of bread to flour		130·3	(Ditto).
Percentage of water to flour	...	52·2	(Very high).
Taking 10 as standard of fair average London bread,—			
Colour, exterior	...	9	
Colour, interior	...	9	
Flavour	...	8	
Texture ...	...	10	(More elastic than Nos. 1 and 2).
General characteristics	...	8	(Loaf small).

No. 5.—From English Wheat.

System—Crushing between rollers.

Flour used	...	280 lbs.	
French yeast	...	1 „	
Liquid potato ferment	...	30 „	
Salt	...	3½ „	
Water ...	...	130·0 „	(Rather low).
Yield of bread when cold	...	352·0 „	(Ditto).
Percentage of bread to flour		125·7	(Ditto).
Percentage of water to flour		46·4	(Ditto).
Taking 10 as standard of fair average London bread,—			
Colour, exterior	...	13	(Good).
Colour, interior	...	12	(Ditto).

Flavour	13	(Very good).
Texture	10	(Silky and good).
General characteristics ...	10	(Loaf medium. Bloom not equal to best English after good harvest).

No. 6.—From Australian Wheat.

System—Crushing between rollers.

Flour used	280 lbs.	
French yeast	1 „	
Liquid potato ferment ...	30 „	
Salt	3½ „	
Water	134·2 „	
Yield of bread when cold ...	355·4 „	
Percentage of bread to flour	126·9	(Medium).
Percentage of water to flour	48·0	(Ditto.)

Taking 10 as standard of fair average London bread,—

Colour, exterior ...	12	
Colour, interior ...	12	
Flavour	12	
Texture	10	(Good).
General characteristics ...	11	(Medium in size).

No. 7.—From New Zealand Wheat.

System—Crushing between rollers.

Flour used	280 lbs.	
French yeast	1 „	
Liquid potato ferment ...	30 „	
Salt	3½ „	
Water	132·0 „	
Yield of bread when cold ...	349·0 „	
Percentage of bread to flour	124·6	
Percentage of water to flour	47·1	

Taking 10 as standard of fair average London bread,—

Colour, exterior ...	12	(Very good).
Colour, interior ...	12	(Ditto).

Flavour	12	(Very good).
Texture	9	(Rather weak).
General characteristics ...	10	(Loaf medium in size).

No. 8.—From Californian Wheat.

System—Crushing between rollers.

Flour used	280 lbs.
French yeast	1 „
Liquid potato ferment ...	30 „
Salt	3½ „
Water	136·8 „
Yield of bread when cold ...	364·0 „
Percentage of bread to flour	130·0
Percentage of water to flour	48·9

Taking 10 as standard of fair average London bread,—

Colour, exterior	12	(Very good).
Colour, interior	12	(Ditto).
Flavour	12	(Ditto).
Texture	9	(Rather weak).
General characteristics ...	10	(Loaf medium in size).

No. 9.—From American Winter Wheat.

System—Crushing between rollers.

Flour used	280 lbs.
French yeast ...	1 „
Liquid potato ferment ...	30 „
Salt	3½ „
Water	130 „
Yield of bread when cold...	346 „
Percentage of bread to flour	123·5
Percentage of water to flour	46·4

Taking 10 as standard of fair average London bread,—

Colour, exterior ...	13	(Very good).
Colour, interior ...	12	(Ditto).
Flavour	12	(Ditto).
Texture	10	(Good).
General characteristics ...	11	(Loaf medium in size).

No. 10.—From American spring Wheat.

System—Crushing between rollers.

Flour used	...	280 lbs.	
French yeast	...	1 „	
Liquid potato ferment	...	30 „	
Salt ...	...	3½ „	
Water ...	...	130 „	
Yield of bread when cold	...	354 „	(Good average).
Percentage of bread to flour		126·4	
Percentage of water to flour		46·4	
Taking 10 as standard of fair average London bread,—			
Colour, exterior	...	8	(Too red).
Colour, interior	...	10	
Flavour ...	...	10	
Texture ...	...	12	(Very good, elastic).
General characteristics	...	9	(Loaf lofty).

No. 11.—From Russian Saxonska Wheat.

System—Crushing between rollers.

Flour used ...	...	280 lbs.	
French yeast ...	...	1 „	
Liquid potato ferment	...	30 „	
Salt ...	...	3½ „	
Water ...	...	130 „	
Yield of bread when cold	...	356 „	(Good average).
Percentage of bread to flour		127·1	
Percentage of water to flour		46·4	
Taking 10 as standard of fair average London bread,—			
Colour, exterior	...	8	(Too red).
Colour, interior	...	9	
Flavour ...	...	9	
Texture ...	...	13	(Very good, elastic).
General characteristics	...	9	(Loaf very lofty).

No. 12.—From Russian hard Taganrog Wheat.

System—Crushing between rollers.

Flour used ...	... 280	lbs.
French yeast	... 1	„
Liquid potato ferment	... 30	„
Salt ...	... 3½	„
Water ...	... 145·4	„
Yield of bread when cold	354·5	„
Percentage of bread to flour	126·6	
Percentage of water to flour	51·9	

Taking 10 as standard of fair average London bread,—

Colour, exterior ...	10	(With fine bloom).
Colour, interior ...	11	(Ditto).
Flavour	9	
Texture	12	(Very good, elastic).
General characteristics ...	9	(Fair loaf, but smaller than expected).

No. 13.—From Egyptian (Buhi) Wheat.

System—Crushing between rollers.

Flour used ...	... 280	lbs.
French yeast	... 1	„
Liquid potato ferment	... 30	„
Salt ...	... 3½	„
Water ...	... 136·8	„
Yield of bread when cold	362·0	„
Percentage of bread to flour	129·3	
Percentage of water to flour	48·9	

Taking 10 as standard of fair average London bread,—

Colour, exterior ...	7	(Very inferior).
Colour, interior ...	6	(Ditto).
Flavour	6	(Ditto).
Texture	7	(Ditto).
General characteristics ...	5	(Loaf very small and heavy, possessed no good points).

No. 14.—From Egyptian (Saida) Wheat.

System—Crushing between rollers.

Flour used ...	...	280 lbs.
French yeast ...	...	1 „
Liquid potato ferment	...	30 „
Salt ...	...	$3\frac{1}{2}$ „
Water ...	...	144·4 „
Yield of bread when cold		358·0 „
Percentage of bread to flour		127·7
Percentage of water to flour		51·6

Taking 10 as standard of fair average London bread,—

Colour, exterior	...	6	(Very inferior).
Colour, interior	...	4	(Ditto).
Flavour ...	...	4	(Ditto).
Texture ...	...	6	(Ditto).
General characteristics	...	4	(Loaf small and heavy, and a degree worse than from the Buhi wheat, Lot 13.)

SYNOPSIS.

The Flours and Breads.

Results obtained in converting the Flours into Bread.

Note.—Of Lots 1, 2, 3, 4, Indian Wheats, the stone flours and roller flours were made into Bread. Of Nos. 5 to 14 inclusive the roller flours only were made into Bread.

Figures in Roman.—System: Grinding under millstones. Figures in *Italics*.—System: Crushing between rollers.

No.	Wheat.	Quantities used.					Yield of Bread when cold.	Percentages.		Colour, Taste, and Texture. (Taking 10 as the standard of fair average quality of London Households Bread made from London Flour, Households and Whites in equal proportions.)					Remarks.
		Flour.	French Yeast.	Liquid Potato Ferment.	Salt.	Water.		Percentage of Bread to Flour.	Percentage of Water to Flour.	Colour, exterior.	Colour, interior.	Flavour.	Texture.	General Characteristics.	
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.								
1	Indian (fine soft white) ...	280	1	30	3½	141·4	364·0	130·0	50·5	10	11	7	8	11	Loaf small and rather dense.
	„ „ „ ...	*280*	*1*	*30*	*3½*	*149·6*	*367·5*	*131·2*	*53·4*	*13*	*13*	*9*	*9*	*12*	*Ditto.*
2	„ (superior soft white) ...	280	1	30	3½	141·6	372·0	133·0	50·6	8	10	7	9	10	Ditto.
	„ „ „ ...	*280*	*1*	*30*	*3½*	*148·0*	*362·0*	*129·3*	*52·3*	*12*	*13*	*9*	*10*	*11*	*Ditto.*
3	„ (average hard white) ...	280	1	30	3½	141·0	370·5	132·4	50·8	6	7	7	10	7	Ditto; texture more elastic.
	„ „ „ ...	*280*	*1*	*30*	*3½*	*149·6*	*365·0*	*130·3*	*53·4*	*10*	*9*	*9*	*10*	*9*	*Ditto, ditto.*
4	„ (average hard red) ...	280	1	30	3½	145·2	376·6	134·5	51·8	5	7	7	10	6	*Ditto; too ricey.*
	„ „ „ ...	*280*	*1*	*30*	*3½*	*147·4*	*365·0*	*130·3*	*52·2*	*9*	*9*	*8*	*10*	*8*	*Ditto, ditto.*
5	English	*280*	*1*	*30*	*3½*	*130·0*	*352·0*	*125·7*	*46·4*	*13*	*12*	*13*	*10*	*10*	*Loaf medium. Bloom not equal to best English after good harvest. Flavour very good. Fine silky texture.*
6	Australian	*280*	*1*	*30*	*3½*	*134·2*	*355·4*	*126·9*	*48·0*	*12*	*12*	*12*	*10*	*11*	*Loaf medium size. Texture good; silky.*
7	New Zealand	*280*	*1*	*30*	*3½*	*133·0*	*349·0*	*124·6*	*47·1*	*13*	*12*	*12*	*9*	*10*	*Loaf medium size. Texture little weak. Dough of putty nature.*
8	California	*280*	*1*	*30*	*3½*	*136·8*	*364·0*	*130·0*	*48·9*	*12*	*12*	*12*	*9*	*10*	*Loaf medium in size. Texture a little weak. Crust too pale.*
9	American (winter)	*280*	*1*	*30*	*3½*	*130·0*	*346·0*	*123·5*	*46·4*	*13*	*12*	*12*	*10*	*11*	*Loaf medium to size. Texture good.*
10	„ (spring)	*280*	*1*	*30*	*3½*	*130·0*	*354·0*	*126·4*	*46·4*	*8*	*10*	*10*	*12*	*9*	*Loaf lofty. Elastic texture. Handles kindly.*
11	Russian (Saxonska) ...	*280*	*1*	*30*	*3½*	*130·0*	*356·0*	*127·1*	*46·4*	*8*	*9*	*9*	*13*	*9*	*Loaf very lofty. Very elastic texture; so strong operatives complained required too much strength in handling it.*
12	„ (hard Taganrog) ...	*280*	*1*	*30*	*3½*	*145·4*	*354·5*	*126·6*	*51·9*	*10*	*11*	*9*	*12*	*9*	*Loaf lofty. Fine bloom. Texture good. Red crust.*
13	Egyptian (Buhi)	*280*	*1*	*30*	*3½*	*136·8*	*362·0*	*129·3*	*48·9*	*7*	*6*	*6*	*7*	*5*	*Loaf possessed no good points.*
14	„ (Saida)	*280*	*1*	*30*	*3½*	*144·4*	*358·0*	*127·7*	*51·6*	*6*	*4*	*4*	*6*	*4*	*Ditto; a degree lower than above.*

NOTES.

The Evaporation and Loss in milling.—The percentages under this heading, it will be noticed, vary considerably from—

No. 11, Russian Saxonska,	stones . . .	0·7
	rollers . . .	0·2 to
No. 13, Egyptian—Buhi,	stones . . .	5·5
	rollers . . .	5·4

These variations must not be attributed chiefly to the differences in qualities of the wheats, as they arise mainly from the waste and loss that is inseparable from working small quantities on a practical scale; about ten quarters of each wheat was operated upon in these experimental workings, whereas in ordinary milling a "grist" will run from one thousand to several thousand quarters. This will be readily understood, when it is borne in mind that, after the working of each separate wheat by either process, the stones or rollers, hoppers, elevators, dressing silks, &c., have to be swept out, and it is impossible to avoid some waste from this cause. In milling operations it is found there is a larger loss, &c., "unaccounted for" on inferior wheats than upon good wheats, but it does not exceed a total of 1 to 2 per cent. For practical purposes, the items Evaporation and Loss should be taken as obtained by competent millers, *viz.*:—

From stones	1 to 2 per cent.
From rollers	1 to 3 per cent.

according to the qualities of the wheats.

Water used in Bread making.—The differences in the quantities of water required by each of the flours from Indian wheats per 280 lbs. flour in making them into bread (ranging from 149·6 lbs. to 141·0 lbs. water) is partly accounted for by the fact of somewhat similar variations in the water absorbed in rendering the wheats mellow for milling.

Weight per bushel of Wheats.—These experimental workings have brought to light a fact well worth noting, *viz.*, that the rule so generally held amongst wheat sellers and buyers, and thought to be without an exception, that the greater the weight of a bushel of wheat so much higher must it rank as a flour yielder, and consequently in value, must now be regarded as true only within a strict limit. A high standard of weight for any given cubical measurement is, no doubt, a good criterion as to dryness of condition and soundness of the grain, for any dampness in grain

causes it to weigh *lighter* per bushel or quarter of measurement instead of heavier (a fact which will surprise the uninitiated). But experienced parties will study with interest the three columns in the synopsis of the wheats showing "weight of 100 separate grains" of each wheat, "weight per bushel," and "yield of flour." Taking equal weights of the four Indian wheats, it will be found that No. 3, weighing 60 lbs. per bushel, yielded more flour than No. 1, weighing 64lbs.; also, that No. 4, weighing 60lbs. per bushel, yielded more flour than No. 2, weighing 62¾ lbs. The reason of this is evident. The four wheats were equally and perfectly dry, and probably would have weighed the same per bushel had the size and shape of the grains of each wheat been the same, but they differ widely in this respect, Nos. 1 and 2 being medium or small, and Nos. 3 and 4 long and arched. Hence the latter will not fill into a measure as closely as the former, leaving larger spaces unoccupied, and causing any given measure to weigh less in consequence. The old rule holds good for wheats the grains of which in size and shape are similar, but it will only mislead if applied to Indian wheats like Nos. 3 and 4. It was, doubtless, adopted at a period when it was the custom for all wheats to be sold by measure, and for sales by measure it is still a correct guide, but as sales are now made by weight rather than by measure, the rule can only safely be applied within the limits indicated.

After a careful examination of the wheats, of the flours and offals, of the bread obtained from the flours, and the records of the workings of each process, we have further to report:—

The four lots of Indian wheats were delivered to us, packed in the ordinary gunny bags, and all in good condition. None of them were sea damaged, nor had they suffered in any way from storage in the ship.

We examined the wheats, and found them to be good representative samples of—

No. I. Indian fine soft white,
No. II. Indian superior soft red,
No. III. Indian average hard white,
No. IV. Indian average hard red,

but were, with the exception of No. 3, much cleaner and freer from impurities than these wheats generally are.

The leading characteristics of these wheats, details of which are in the tabulated statement, are as follows:—

The fine soft white (*Lot 1*).—Grains white, medium sized, and regular; fairly mellow; skin thin; handled exceedingly well;

weight per bushel, 64 lbs., which is only equalled by specially fine samples of any wheat. Clean and free from seeds; contained 2 per cent. of weevilled grains.

Results of the milling and bakings prove it is an exceedingly good and useful wheat; the flour being great in quantity, of pure white colour and superior bloom, and with a slight beany flavour. It is more suitable for markets requiring *white* flours rather than strength, owing to its containing an exceptionally low percentage of gluten. The yield of bread from it is very large.

Superior soft red (*Lot 2*).—Grains dull light-brown, with about 5 per cent. white wheat. In size, half medium and half small; semi-hard; skin thin; handled very well; weight per bushel, 62¾ lbs., which is only reached by fine wheats. Clean and free from seeds; contained only a trace of weevil.

Results of the milling and bakings prove it is a good and useful wheat; the flour being great in quantity and of medium colour and strength, with a slight beany flavour, and containing an average of gluten. Suitable for markets requiring flours of medium strength and colour. The yield of bread is exceptionally large.

Average hard white (*Lot 3*).—Grains light yellow and semi-transparent, with a little hard red; skin thin; in shape long and arched. The wheat itself was clean, but intermixed there was about 3 per cent. hard dry bits of mud (which spoiled the handling), otherwise free from admixture. Weight, 60 lbs. per bushel. Weevils only a trace.

Results of the milling and bakings prove it is a useful wheat for markets requiring strength; flavour beany; the gluten (by water test) averaging 12 per cent. This wheat (and No. 4) are probably unsurpassed by any other wheats in the world as regards the quantity of flour yielded. In colour, medium. Specially useful for mixing with very damp English wheats to bring them into condition for milling. It is also a profitable wheat for millers, owing to its requiring 8·4 per cent. water to render it sufficiently mellow for use.

To this wheat, and to the Indian average hard red (Lot 4), must be awarded the distinction of *producing more bread than any other flour*, making it a "baker's" flour as well as a "miller's." The yield of bread is exceptionally large.

Average hard red (*Lot 4*).—Grains very large and coarse, long, arched and pointed; in colour dull brown, and semi-trans-

parent, with an admixture of 10 per cent. fine soft white; skin thin; handles well; contains a little gram, seed, linseed, and barley. Weight, 61¼ lbs. per bushel. Weevils only a trace.

Results of the milling and bakings prove it produces a common and dry strong flour, in almost unequalled quantity. In colour, inferior. A profitable wheat for millers, as it takes 7·6 per cent. water to render it sufficiently mellow for use. The yield of bread is exceptionally large, making it a "baker's" flour as well as a "miller's." (See remarks on Lot 3.)

For characteristics and particulars of the other wheats and flours obtained from them, we beg to refer back to the tabulated statements, and need here only further remark respecting them.

No. 5 English.—The yield was poor, undoubtedly owing to these wheats this season being in poor condition, and colour of flour not equal to that from this wheat when in prime condition.

No. 6, Australian, and No. 7, New Zealand.—High yields. Colour and bloom of flours superior, and other characteristics very similar, except that Australian is decidedly stronger.

No. 8, Californian.—These wheats would be improved if the small quantity of barley and oats they so frequently contain could be kept out, which cannot be entirely removed by any separating machines, as they slightly depreciate the flour. Whilst below Australian and New Zealand in yield and strength (the former arising from its somewhat thicker skin), perhaps in the special points of colour and bloom this flour, and that from American red winters (No. 9), are unequalled.

No. 9, American red winter.—The same remarks as on Lot 8 as to yield and quality of the flour.

No. 10, American spring.—Medium yield, arising from thickness of the skin, and the cockle and the buckwheat present. The flour is of good colour and superior strength.

No. 11, Russian, Saxonska.—Medium yield of flour, good in colour, and in strength quite unequalled. An invaluable wheat for mixing with weaker ones to add strength to the flour. Of gluten it contains (by the water test) 22·1 per cent. (dry), or double of that contained in the English lot.

No. 12, Russian Taganrog.—Good yield, colour of flour good, with much yellow bloom, and for strength ranks next to Saxonska (No. 11).

No. 13, Egyptian, Buhi.—Ranks only one degree above Saida (Lot 14).

No. 14, Egyptian, Saida.—Deservedly ranks as the poorest wheat in the market; possesses no good qualities, and is not nearly worth its price.

The Two Systems of Milling.

That of *grinding under millstones* has been in operation from time immemorial, and with but slight improvements, those of recent years relating chiefly to the dress or separation of the offals from the flour by the employment of cylinders lined with silk, instead of wire, within the dressing machines. This system produces flour of one "run" or quality, and does not offer facilities for the production of flours of high, medium, and low grades from the same wheat. Unless care is taken in the grinding to keep the stones sufficiently high, the flour is apt to be "dead" or "killed," that is, to lack anything approaching to granular character, owing to the stones having been employed too close together. On the other hand, if the stones are worked too "high," a loss results from all of the flour not being removed from the bran. It is inseparable from this grinding system that some of the outer skin or bran is also torn or ground into flour, so preventing the attainment of perfection of colour. It is well adapted, however, for the production of common ordinary flours, for, as will be readily seen, it must produce a *greater quantity* of flour than a system which more thoroughly separates the offals.

By the roller system flour is produced by flattening or squeezing the grain through a series of rollers, as distinguished from the tearing or grinding of millstones. The wheat is first cracked through a first set of rolls and its sieve, so separating a small quantity of flour and dirt, the latter being liberated out of the crease of the wheat, and is not removable by any system of brushing or blowing. It is important to get rid of this impurity at the initial step of the process, as it then does not get incorporated with the subsequent flours. The cracked and purified wheat is then passed on through other sets of rolls and sieves, and rendered into middlings and flour. From these middlings the higher grades of flour are made; they are first freed from all light particles of the skin by being passed through "purifiers," and then through several successive sets of rolls and silks, each set yielding flour of a different grade. Each grade may be kept separate, or caused to run together into a mixing worm and so become one run of flour. (The wheats operated upon by this system in these experimental workings were so rendered into flour of one run or quality.) A leading feature in this system is that

the germ of the wheat, in which lies the chief portion of the colouring matter of the grain, is not torn or ground into flour as it is by the system of grinding under stones, but the action of the rollers is to squeeze or flatten it, and, from its soft and oleaginous nature, to increase its size, so rendering its separation from the flour easy. The outer skin or bran is also freed from its adhering flour by the same pressure. But, inasmuch as hardly any of the bran is crushed into flour, the yield of offals must be larger than from the grinding system. The advantages of the system are, less liability to "kill" or destroy the granular nature of the flour, the removal of the dirt found in the creases of the wheat, and the separation of the germ, so rendering the attainment possible of a high standard in the character, colour, and bloom of the flour. It is attended with a slightly increased yield of offals, which of course means the quantity of wheat required to produce a sack of flour must be proportionately increased; as a rough average, say 400lbs. wheat for rollers against 380lbs. for stones. Offals of very similar quality are produced by both systems, *viz.*, coarse middlings, pollard, and bran, except that the bran from the rollers is smaller than from stones, and is consequently slightly lowered in value, say about 10*s.* per ton. The percentages of offals yielded by each system are given in the tabulated returns.

In these experimental workings the meshes of the silks through which the flours were dressed were as follows:—

In the grinding process ... Silks No. 12.
„ roller „ ... „ „ 13 (or one shade finer).

The Offals.—This is a subject of minor importance as compared with the yields and qualities of flour and bread, and it is only needful to state that, of the offals included in these returns, the middlings from both systems of milling were worked down to the quality known on the Mark Lane market as "coarse mids., fair average," the bran to "bran from stones" and "bran from rollers," and the pollard to "pollard, fair average."

Gluten in bread.—From an economical standpoint it may be said the nutrition of bread mainly depends upon the gluten; or, in other words, the nitrogenous or albuminous compounds or flesh formers, contained in the flour from which it is produced. The starch would be equally important if it could not be obtained from other sources in as suitable a form at a much cheaper rate—as in rice, Indian corn, and potatoes. But its gluten is not obtainable from other sources, of equal quality and flavour. Hence its special value as a constituent of wheat. Further, upon the gluten in flour depends the elasticity of the texture of the

bread, and consequent freedom from density or heaviness. It is generally believed that upon the percentage of gluten in flour depends the *yield* of bread that may be obtained from it, as illustrated by the Hungarian flours, which are almost unequalled for yield of bread, and rank high in gluten, but this is erroneous, as proved by the experimental workings now under review. It will be found that the flours high in gluten do not produce the most bread, unless, at the same time, they possess a high degree of *dryness*, for it is upon the *dryness* of a flour that the yield of bread mainly depends, and not upon the gluten. The two lots of flour from Russian wheats (Nos. 11 and 12) are those which are highest in gluten, yet they do not yield as much bread as any of the four Indian wheats (Nos. 1 to 4), and the difference in yield from the latter would have been still further increased had they not been previously mellowed with water, as noted, before milling; confirming it is the dryness of a flour that determines the yield of bread.

Another erroneous idea is, that upon the quantity of gluten present depends the height or loftiness of the bread. This would be correct, provided the fermentation of the dough were in all cases carried to a precise degree; but it varies widely, and it will be found the loftiness or height of the bread depends chiefly upon a high degree of fermentation, provided it be not carried to great excess, rather than upon the gluten. This is illustrated by the bread consumed in the London district, which is made from flours rich in gluten, yet is not so high or lofty as the bread consumed in some other districts, which is produced from flours containing much less gluten, the popular taste in London demanding strength, nutrition, and then fair colour, whereas, in the districts referred to, a high degree of whiteness is demanded before nutrition.

The four Indian Wheats.

In addition to the particulars contained in the foregoing returns, we have to report that to any one experienced in the requirements of the wheat and flour markets of the United Kingdom and indeed, of most other countries, it will be evident there is no probability of these Indian wheats coming into demand for manufacture into flour *without a liberal admixture* of other wheats. They all possess in a marked degree the same characteristics of great dryness, and a distinct beany and almost aromatic flavour, inseparable from wheats grown in the climates and soils of the tropics. Also the flours are ricey, the texture of the breads is too close, and the crust is hard and brittle. But these characteristics

do not detract from their usefulness in any important degree. As is well known a miller cannot show skill in his craft to greater advantage or profit than that with which he selects his wheats, and mixes his grists, so as to produce to best advantage a flour from which bread can be made of the colour, bloom, strength, and flavour desired, and with all a good yield.

We pronounce them to be exceedingly useful wheats; in fact hardly equalled for what is deficient and wanting in the English markets by any other wheats. Their chief characteristics are just those in which the wheats grown in our variable climate are most deficient. Their great dryness and soundness renders them invaluable for admixture with English wheats that are in any degree out of condition through moisture, and the great proportions of the wheats harvested here have been in that condition for some years past, a condition that must prevail in all other than that of wheats harvested and stored during fine and favourable weather; and this the English farmer knows, greatly to his cost, is a state of climate that is by a long way the exception rather than the rule. Added to their dryness, the thinness of the skins of these wheats and consequent greatness of the yield of flour, must always place them in the front rank as a "miller's" wheat, whenever they are handled with reasonable intelligence and skill.

Such unprecedented yields of flour, as shown by these wheats ranging (by ordinary grinding) from 77·46 to 80·52 per cent. against English 65·2 and American spring 72·2, speaks volumes in their favour, and their value is still further increased by another point of merit of almost equal importance, *viz.*, a larger percentage of bread may be obtained than from any other of the flours included in this review.

That, for the best of these Indian wheats (the fine soft white), on the day they were valued on Mark Lane market, a price was offered as high as that for American winters, New Zealand or English (see list of values in synopsis), proves that the great value of the Indian wheats is becoming recognized here, a knowledge that will ere long extend to all our markets. The other lost of Indian (Nos. 2, 3, and 4) were lower in value to the extent of 4*s.* to 5*s.* per quarter, as might almost have been expected from the difference in colour and other characteristics; still, as these latter wheats become better known here, this difference in price will be somewhat lessened. Their beany flavour is not a serious obstacle, as fair average deliveries, when well cleaned and properly dealt with, can be employed in the proportion of 25 per cent. to 50 per cent. along with home-grown or other wheats,

such as Americans, possessing a fine sweet, milky, or nutty flavour.

Glancing at all the facts here elaborated, it is evident that these wheats afford a larger margin of profit, both to the miller and baker than any other.

We venture to record a conviction we have long held, strongly emphasized by the results of these experimental workings, of the measureless importance of the great resources of the Indian empire being developed to the utmost in producing wheat for this country. Farmers here are finding that to live they must produce beef and mutton rather than grain, hence the greater need of resources of supply under our own control.

It is evident such a conviction is common to the members of your Honourable Council, as testified by their unceasing efforts in this direction. And we desire heartily to congratulate them upon the important fruits arising from their labours. The character and general excellence of the Indian wheats are improving with the deliveries of each successive season. The Indian wheats now specially under review were delivered to us in excellent condition (see details) with freedom from dirt (except Lot No. 3), barley, gram, and other impurities, also with a freedom from weevil, rarely equalled by Indian wheats, except the prime parcels of the past season, and there is no doubt an outlet in this country and the European continent for unlimited quantities at prices that shall prove remunerative to all parties concerned, either in their growth, transportation, or conversion into flour and bread.

15th December 1882;
10, Mark Lane, London.

We have, &c.,
McDOUGALL BROS.

G. C. B. Press, Simla.—No. 662 R. & A. D.—5-11-83—500.

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on 31 October, 2019